48120 April 1987 $2.95

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

Canada $3.75

Basics of Radio Control

World Champ SUPRA-FLY

How To Cover Your Plane

AVANT-GARDE R/C Helicopter

AGGRESSOR Jet

Hot!

71896 48120 04

APRIL 1987 VOLUME 114, NUMBER 4

MODEL AIRPLANE NEWS

ON THE COVER AND ABOVE: Designed to have nostalgic looks and Jungmeister flight characteristics, designer Pete Bartoe created this unusual biplane known as the Skyote. The plane has been flown in airshows by Bob Hoover and is piloted here by Harry Shepard of Sparta, New Jersey. Get the full scoop on this airplane in Budd Davisson's story on page 20. Both photos by Davisson.

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

Model Airplane News (ISSN 0026-7295) is published monthly by **Air Age, Inc.,** 632 Danbury Rd., Wilton, CT 06897. Second class postage paid at Wilton, Connecticut, and at additional mailing offices. Subscription rates are $25 for 1 year (foreign $33), $47 for 2 years (foreign $63), $65 for three years (foreign $89). **Postmaster:** Send Form 3579 to **Model Airplane News,** P.O. Box 428, Mount Morris, IL 61054.

MODEL AIRPLANE NEWS
The world's premier R/C modeling magazine

SUBSCRIPTION PRICES:
U.S. & Possessions (including APO & FPO): 1 year $25.00; 2 years $47.00; 3 years $65.00. Outside U.S.: 1 year $33.00; 2 years $63.00; 3 years $89.00. Payment must be in U.S. funds.

MODEL AIRPLANE NEWS is published monthly by Air Age, Inc., 632 Danbury Rd., Wilton, CT 06897. Connecticut Editorial and Business Offices, 632 Danbury Rd., Wilton, CT 06897, phone 203-834-2900. Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Y.M. Micik, Treasurer. Second Class Postage paid at Wilton, Connecticut, and additional Mailing Office. ISSN No. 0026-7295.

CONTRIBUTIONS: To authors, photographers, and people featured in this magazine, all materials published in *Model Airplane News* become the exclusive property of Air Age, Inc., unless prior arrangement is made with the Publisher, in writing.

ADVERTISING: Advertising rates available on request. Please send advertising materials, insertion orders, etc., to Advertising Dept., Air Age., Inc., 632 Danbury Rd., Wilton, CT 06897, phone 203-834-2900.

CHANGE OF ADDRESS: To make sure you don't miss any issues, send your new address to Subscription Dept., *Model Airplane News*, P.O. Box 428, Mount Morris, IL 61054, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide the extra postage. Duplicate issues cannot be sent.

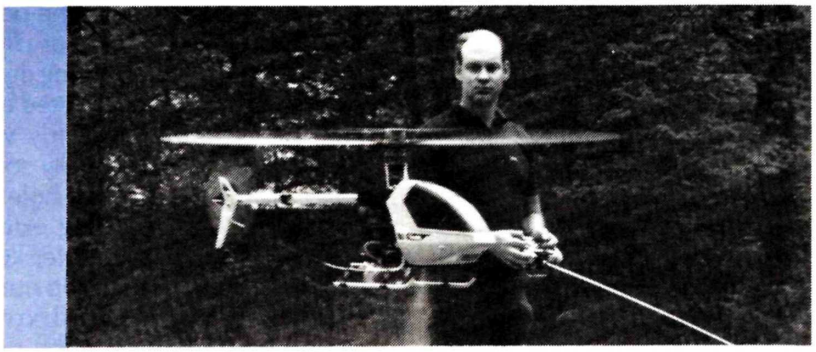
POSTMASTER: Please send Form 3579 to *Model Airplane News*, P.O. Box 428, Mount Morris, IL 61054.

Editorial

by DAN SANTICH

More Helicopter Coverage!

EVEN BEFORE the venerable Wright Brothers embarked upon their historic flight, hovering—a facet of flight that has always intrigued man—was attempted and to a degree actually accomplished. I'm sure you recall the early movie of a fellow seated on what looked like a farm tractor with a huge undulating umbrella. He would have probably had great success as a pile driver...but a helicopter? How times have changed. Today not only do we take for granted the splendid capabilities of helicopters, but they generally seem to have a back seat in aviation on the whole. Certainly the high price of a four-place chopper has something to do with their relative obscurity at the local airport, but in the eyes of modelers the helicopter has long been passed by due to their apparent complexity and need for constant "tweeking."



Often, after years of trial and error, scientific struggle and scrutiny, a rendered product becomes second nature to us and thus without fan-fair is taken for granted. So it is with the R/C helicopter.

No longer must we invest many dollars only to end up frustrated and defeated, as was the case with R/C copters not long ago. That's changed, now you can purchase a complete helicopter that is virtually fool-proof. There are modelers tuned to the helicopter movement in every city, making information readily available. Hobby shops and even mail order houses now have question-answering hot lines. The helicopter designs have not only improved dramatically but engines and radio systems exclusively for copters have followed suit, making it simple to join in the action. And action there is. Contests for helicopters have greatly increased, as have participants in these events. In a word, the helicopter has "risen."

What this means is that we have to get on the ball and provide you with as much information as possible about them. And we intend to do just that. We shall have a Helicopter Special Issue in the very near future to deal with this exciting aspect of our great hobby. And we'll be featuring more helicopter info with each coming issue.

THIS MONTH. If you want something hot, try the Hotselliptic, this month's construction article. It's an easy-to-build rocket ship that will surely turn some heads at your flying field. Mike Lee witnessed Hanno Prettner's demonstration of the Hobby Shack Supra-Fly and couldn't get over the knife-edge loop Hanno did. Mike finally got his kit and his review is presented herein. There's a lot more, too. Mike Lee built the new Coverite Black Baron (Mike's a busy boy), Frank Tiano likes the Violett Aggressor duct-fan model, Paul Tradelious took time out from his duties as an F-16 jock to build the Robbe Avant-Garde helicopter, and yours truly gives some advice on covering your model. On top of that, you can become rich and famous. Look for the ad on our *Model Airplane News* Design Contest, also in this issue.

Happy hovering! ■

Airwaves

Scratch-building

I've enjoyed your writings in *Model Airplane News* and look forward to receiving a new issue each month. When the February issue arrived, I jumped at the cover item "How to Scratch-build." Great! I thought, here will be the tips and suggestions that will save me hours and hours when I start designing the Globe GC-1 Swift, for instance. Then I read "...when you buy plans..." further on in the article, and thought, that's where all the apprehension lies. There are a lot of questions to be answered before I get out an X-Acto and start; what sort of rules of thumb are there for the following variables?

Engine size versus airframe weight. Wing area and wingspan—does it matter?

Should the center of gravity usually be at one-third of the wing chord? What sorts of planes need it forward or back of there?

What's the best way (or a good way) to scale airfoil forms for tapered wings?

Does airfoil thickness need to be changed when scaling a real airfoil?

Can the builder plan on anything like a scale prop diameter? Most model props seem to be smaller than scale to accommodate our high-rpm two-cycle engines. What about four-cycles?

How do you build-up fuselages that aren't boxes, like the CG Eagle? Jigs? A stiff metal rod through sheet formers? Tabs that raise each former to the proper height? (ugh) Foam?

What are some of the comparative advantages of built-up foam wings?

What difficulties are there for the modeler who wants to melt his/her own weird-shaped canopy?

Maybe some of these questions will find their way into "Basics of ScratchBuilding."

TED SWIFT
Palo Alto, CA

I plan to do a series on designing sport models in the near future and hopefully all of your questions will therein be resolved. DBS

"Lost Prop" Game

I read your January editorial with great interest because of the potentially severe consequences of a flying, or broken, propellor. During my two years in R/C, I've encountered backfire and prop loss regularly while learning to fly. I eventually sought relief: I drilled a 1/16-inch hole into the propellor shaft at the extreme end enabling a pin or cotter key to be placed on after the prop nut was in place and tightened. And no more lost props! To drill this prop-saving hole, I used "EDM," electro-dynamic drilling, which burns with an electric arc—it only takes a minute. I've done this on several two- and four-cycle engines to effectively solve the "lost prop" game. Finally, why don't all engine manufacturers EDM their engine shafts?

OSCAR M. OLSEN
Valinda, CA

Barons' Great Race

On behalf of the Sacramento Red Barons I'd like to thank you for publishing your article on our Great Race. The members got a real bang out of reading about themselves in a national magazine.

Through the years, hundreds of hours have been spent by many people, running, organizing and planning the event. The payoff for them is knowing they've created something worthy of national recognition.

ED SCHUR
Rocklin, CA

Knight Twister

Just a note to say how much I love my Knight Twister. I used the Super Tigre 3000, Futaba FMW/Q receiver and S131 servos. The Super Tigre didn't really perform until I changed the carb to an O.S. model and went with a Dynathrust 18-10 prop. I added 3° washout to the top wing tips. At 17.5 pounds, it was ready to go. The only remaining problem is landing—it's unlike most bipes. This was my first scratch-built, though, and I'm proud of it.

DAVID MELL
Lawrenceville, GA

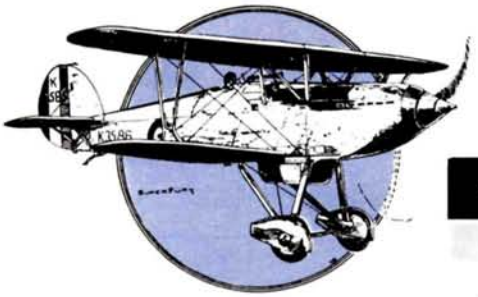
Oshkosh '87

I'd like to say how much I appreciate your coverage of our annual event. Being an avid *Model Airplane News* fan for many years—in fact, I was one of the young ones building models with balsa (the Comet and Cleveland kits) and it has influenced my life in aviation. The articles in your magazine will continue to bring alive the dreams of the young and old. I do very little modeling now; in my spare time I build the big ones instead. In looking at many of the models we have here at the museum, 8- and 10-footers, with the amount of energy that goes into them, one could instead build a home-built!

Oshkosh '87 is just around the corner, and we hope many of the readers of *Model Airplane News* will take this opportunity to come and see us and enjoy with us the wonderful world of sport aviation.

PAUL H. POBEREZNY
Pres., Experimental Aircraft Assoc.
Oshkosh, WI

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," Model Airplane News, 632 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length.

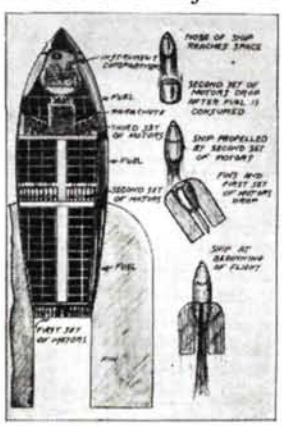


Fifty Years Ago

by DAN SANTICH

APRIL 1937 was a month that could well be forgotten except for its significance in aviation history. For the first time a civilian target was intentionally destroyed from the air. The place was Guernica, Basque, and the aircraft were German He IIIs and Ju 52s during the Spanish Civil War. The date was April 26, 1937, and Luftwaffe capabilities were never left in doubt again.

Be that as it may, the United States was still considered invulnerable by many. C.G. Grey, editor of *The Aeroplane*, wrote for *Jane's All the World's Aircraft 1937*, "The Hawaiian Islands should not be worth the cost of a major war in the Pacific. And yet the United States have one of the biggest and possibly the most efficiently-armed Air Services in the world. The United States have nothing to fear from the Atlantic side, and still less from Canada or from Mexico." Of course in 1937 no one took the Japanese seriously either. Actually, the U.S. then had fewer and less advanced aircraft than any major power. But things would change.



Trips to the moon in rocket ships was discussed in an article in April 1937 Model Airplane News.

What were we talking about in the April 1937 issue of *Model Airplane News*? Space travel! An article by Nick Limber stated that since rockets were known to function in outer space (a fact established in 1903 by Ziolkovsky, a Russian scientist), American newspapers would proclaim "Scientists Land On Moon. Read All About It!" within a generation. Although it took a bit longer (20 years longer), his predictions concerning space flight and the method of propulsion were very accurate. An interesting aspect of this particular article, as well as others that appeared during that time, is that

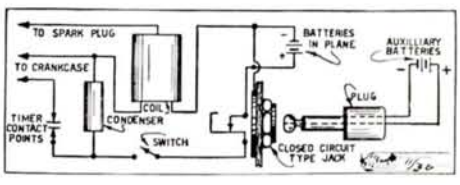
Movie star Reginald Denny produced gas model kits in Hollywood.

Model Airplane News was not simply a hobby magazine, but also an aviation magazine. It covered all aspects of aircraft, be they full-scale, models, or simply ideas. And so it is today.

Modelers were having a ball with all of the new engines and kits that were coming their way via such companies as Cleveland, Megow, Ohlsson, Guillow, Berkeley, Comet, and Scientific. Even movie stars were in the business. Famous actor Reginald Denny was making several kits in his factory in Hollywood, and his "Denny Junior," a large gas-engine-powered model, was very popular at only

$10 for the complete kit. Denny was also tooling up for an engine called the Skycharger. It was because of Denny's influence that many models were used in the movies in place of full-size ones during crash scenes.

It was ten years since Lindbergh's epic flight and near the end of the so-called Golden Age of aviation. The modeling scene was exploding with activity, and *M.A.N.* was there to tell you about it, fifty years ago this month. ■



The above diagram shows a typical spark ignition setup.

John Pond and his Cavalier were prominent figures in modeling.

TOOLS

Basics of Radio Control

by RANDY RANDOLPH

YOU OLD timers move on, this will be for those new to the sport. It's a subject that is usually overlooked, because the knowledge of hand tools is usually taken for granted.

It would be most difficult to run any household without a hammer, a screw driver, and pliers, but the tools that are necessary around the house are not necessarily the best for building model airplanes. That is not to say that the standard hammer, screw driver, and pliers are not useful, but rather that different types of these tools, with the addition of others, are *more* useful.

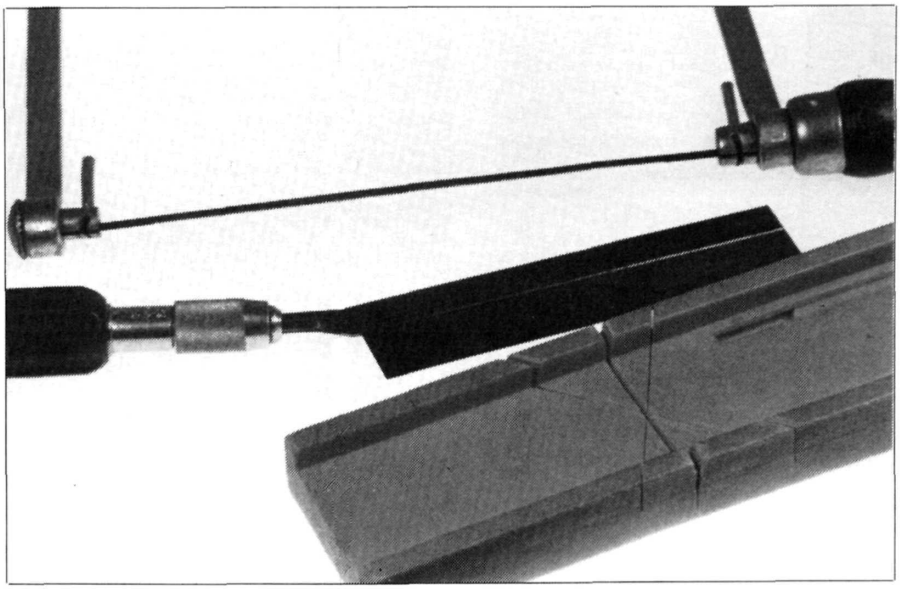
The first tool that must be acquired is the razor knife. Actually, a single-edge razor blade can be used in place of the razor knife, but the razor blade works better as an addition rather than a substitution. There are many brands and types of razor-knife handles, pick one that is comfortable in your hand and that you can manipulate with ease.

The most popular and useful blade for any handle is the No. 11, which is a triangular-shaped blade with a sharp point. When the blade becomes dull, discard it and insert another in the handle. Dull knives are much more dangerous than sharp ones because of the extra pressure needed to make them cut—and cut badly at that!

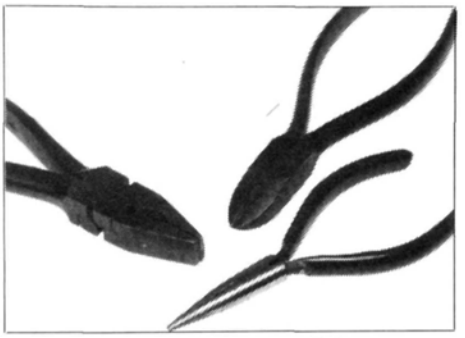
The razor knife may be the primary cutting tool, but the razor saw and jig saw are also very valuable. The razor saw, in combination with a miter box, is very handy for making straight, smooth cross-cuts in balsa strips for good solid joints. The angled slot in the box makes fast work of sawing out right-angle gussets. The coping, or jig, saw is a must for plywood, or any of the harder woods or dowels.

Although most kits are to a large degree prefabricated, it's unusual for the firewall in any of them to be drilled. Because of the wide variation of engine make and size that could be installed, the kit manufacturer leaves the selection of engine and mount up to the buyer. An assortment of drill bits and a hand drill are almost a necessity for installing engine mounts on firewalls as well as drilling the mount to accept the engine. The minimum number of drill bits would include the 1/16-, 3/32-, 1/8-, 5/32-, 3/16-, and 1/4-inch sizes. The smallest size is for drilling extra holes in servo arms and the largest for mounting hardwood dowels.

It goes without saying that if engines



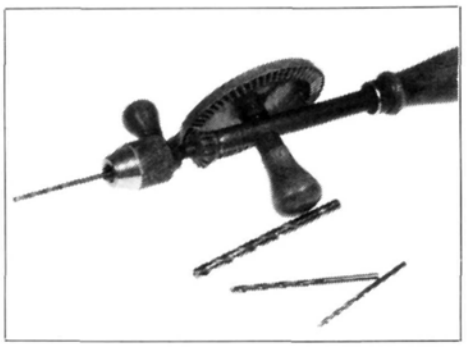
Tools used to get accurate cuts include coping saw, X-Acto saw and mitre box.



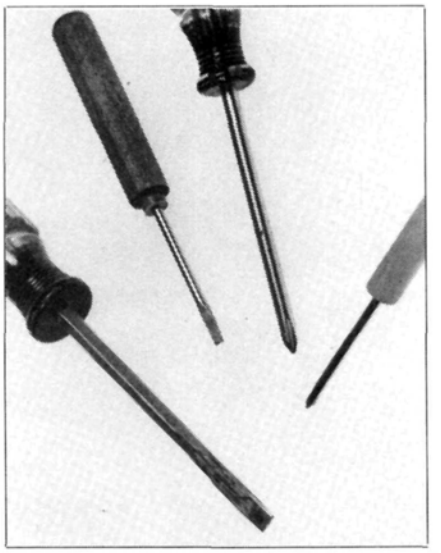
Long-nose pliers, diagonals and heavy-gauge wire cutters should be of high-quality steel.

are mounted with screws, it's necessary to have an assortment of screw drivers! Both conventional and Phillips-head screws are used in modeling, so screw drivers for both are needed. Blade widths of 1/4 and 1/8 inch will suffice for conventional screws, and Phillips-head drivers with 3/32- and 1/8-inch shafts should be adequate for most situations in which those types of screws are used. Good tools with hard blades are well worth the extra few cents.

Squeeze tools, pliers, and diagonal cutters are the heavyweights in a modeler's toolbox. A heavy-duty pair of flat-nose pliers take a lot of work out of bending wire for landing gears and wing mounts. Even with good heavy pliers the job is still not easy, just easier! Diagonal cutters are good for cutting wire up to 3/32 inch in diameter, larger wire requires bolt cutters. Heavy wire can ruin a pair of diagonal cutters almost instantly.



A hand drill and assorted drill bits are essential.



Assorted screwdrivers include blade type and Phillips in various sizes.

Long-nose pliers are great for bending small soft wire and for holding nuts in place while screws are installed. They act like long skinny fingers for fishing lost items from the small dark places dropped items seem to like so well. Every modeler should have a pair; 2-inch long jaws seem about the right size.

Paint brushes of various sizes from 1/8 to 1/2 inch, including the throwaway kinds for spreading epoxy, and steel straight pins complete the basic tool requirements. Good quality brushes, properly cleaned after each use, will outlast the cheap kinds many times over. In all tools, you usually get what you pay for and the best is always a bargain.

There are a number of specialized tools made for modelers, and a number that modelers make for themselves to do specific jobs. The basic tools listed above will accomplish 95% of modeling tasks. Experience with them will give the knowledge to acquire those additional tools which clutter the walls and drawers of all modelers' workshops.

Randy Randolph, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

Control Tower

by CHARLIE KENNEY

THIS MONTH I'll review another new Futaba* radio, the Conquest FP-5NH, specifically designed for helicopters. This system uses FM proportional radio control with newly designed sticks and control functions strictly designed for the helicopter afficionado at a very reasonable price. The FP-5NH set I received consisted of the FP-T5NH transmitter, FP-R107N seven-channel receiver, and four FPS130 servos. Ni-Cds are used throughout. Various accessories are provided, consisting of an FBC-8B charger, four sets of servo accessories (horns and mounting hardware), frequency flag, neck strap, and clip. My particular evaluation system operated on Channel 38 (72.550 MHz) using an orange and gray frequency flag.

Let me highlight some of the new system's features:

TRANSMITTER—FP-T5NH

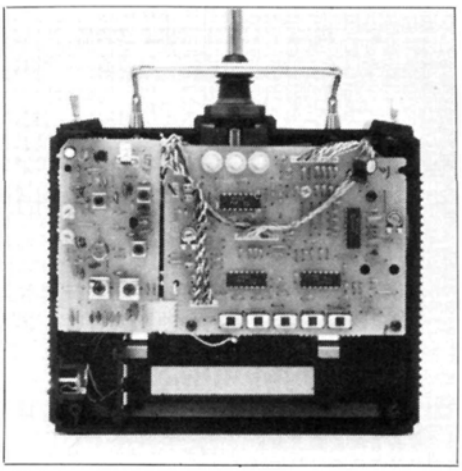
- Reliability has been substantially improved by using robotics to assemble the PC board.
- Servo-reversing switch for each channel.
- Aileron and elevator AST (Adjustable Servo Throw). Servo throw can be set as desired.
- Easy-to-adjust two knob-type revolution mixing. Throttle pitch control rudder mixing.
- Pitch control trimmer. Approximately 30% of the pitch control servo throw can be trimmed, which allows optimum pitch control.
- Throttle hold switch and trimmer for auto rotation. This allows rotor rpm to maintain an effective control speed, even when the pitch is reduced.
- Newly designed open gimbal sticks operate smoothly and reliably, and spring tension mechanism allows adjustment of the operating feel of the stick lever.
- Non-slip adjustable stick head allows adjustment of the stick length as desired.

photos by ACE PHOTOGRAPHERS

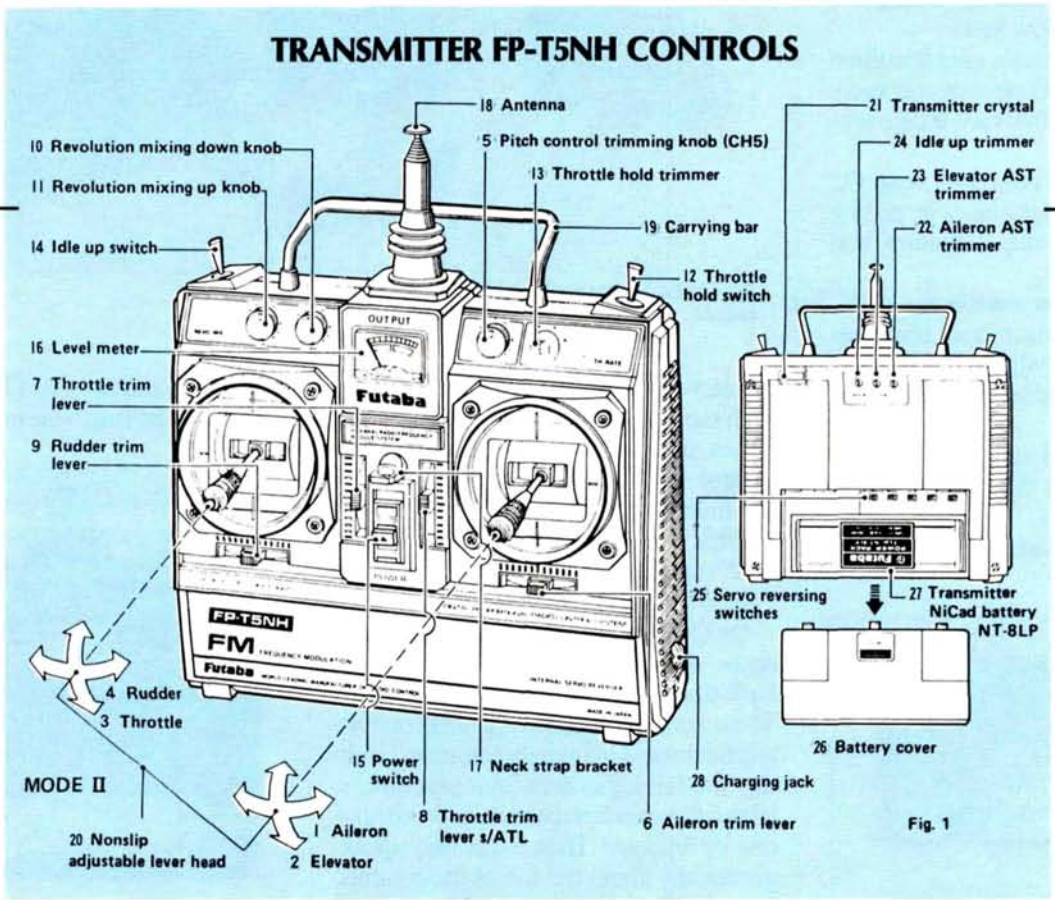
- Throttle ATL (Adjustable Throttle Limiter) type throttle trim. As the high position does not change even when the trim is altered, it's very convenient when connecting control linkages.
- RF PC module employed.
- Functional case, created through ergonomic design.
- Output level meter on the transmitter indicates the power supply voltage and relative power output.
- Excellent radiation efficiency, utilizing 8-stage telescoping antenna.
- Neck strap bracket provided as standard. Operation is easier if the transmitter is hung from your neck by using the neck strap provided.
- Built-in Ni-Cd battery.

RECEIVER—FP-R107N

- Narrowband ceramic filter provides a 40 kHz channel separation.
- Built-in pulse noise rejection circuit



Business end of the transmitter, RF section left, encoder and control circuits right. Note five servo-reversing switches.



resists the effects of noise interference.

- High sensitivity and 7-channel FM receiver realized by using a specially developed monolithic IC (Integrated Circuit) and high sensitivity IF (Intermediate Frequency) amplifier.
- Selective squelch circuit eliminates the effects from transmitters outside the 72 MHz band during simultaneous multi-band flights.
- Futaba custom IC and overrated capacitors substantially improve stability against battery voltage changes.
- Vibration-resistant pin connectors.
- Fiberglass epoxy PC board with through-the-hole plating is vibration and shock resistant.

SERVO—FP-S130, SMALL RUGGED SERVO

- Skew-type armature motor movement of the trim control by even one notch is tracked by a skew type motor which displays performance approaching that of a coreless motor.
- New indirect drive potentiometer improves vibration and shock resistance, plus neutral accuracy.
- Futaba low-power custom IC provides extremely high torque, narrow

TRANSMITTER—FP-T5NH

Operating System: Two-stick, 5 channels w/servo reverse, aileron and elevator AST, helicopter mechanism
Transmitting Frequency: 72 MHz band
Modulation System: FM (Frequency Modulation)
Power Requirement: 9.6V Ni-Cd battery (NT-8LP)
Current Drain: 136 mA (at 9.6V)
Size: 7.0x6.8x2.2 inches
Weight: 1 pound, 13 ounces

RECEIVER—FP-R107Q

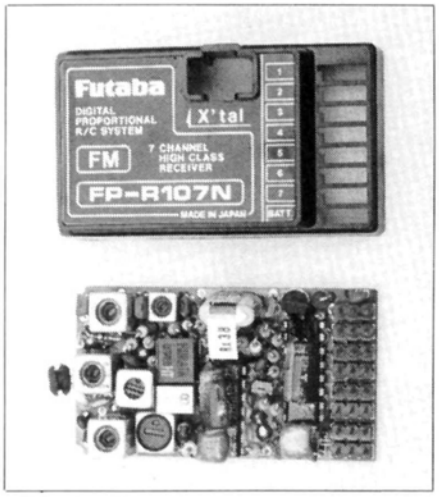
Receiving Frequency: 72 MHz band
Intermediate Frequency: 455 kHz
Power Requirement: 4.8V Ni-Cd battery (4 cells)
Current Drain: 19 mA
Dimensions: 2.23x1.65x0.94 inches
Weight: 1.850 ounces
Receiving Range: 550 yards on the ground, 1,100 yards in the air with fully charged batteries

SERVO—FP-S130

Control System: Positive pulse width control
Operating Angle: One side 45° or more
Power Requirement: 4.8V
Current Drain (IDLE): 4.8V, 6 mA
Output Torque: 48.7 ounce-inches
Operating Speed: 0.24 sec/60°
Dimensions: 1.6x0.8x1.6 inches
Weight: 1.92 ounces

dead band, and excellent tracking.

- Fiberglass reinforced PBT (polybutylene terephthalate) injection-molded servo case is mechanically strong and invulnerable to glow fuel.
- Strong polyacetal resin ultra-precision servo gear features smooth operation, positive neutral, and very little backlash.
- Fiberglass-reinforced epoxy resin PC board with through-the-hole plating improves servo amp vibration and shock resistance.
- Rugged three-pin connector eliminates faulty contact and improves reliability against vibration and shock. Housing has a reverse insertion prevention mechanism.
- Special grommets simplify mounting of the servo and have an excellent cushioning effect.
- Six special adjustable splined horns are available.

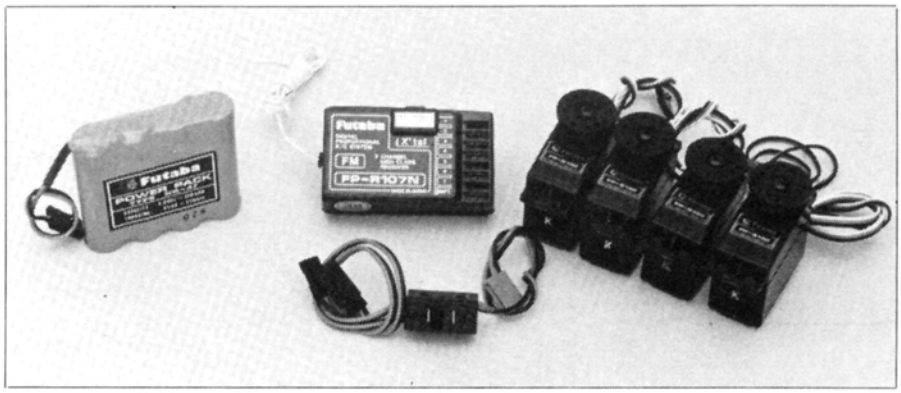


Futaba FP-R107N seven-channel receiver, FM modulation used.

- High 48 oz-in. maximum output torque allows use in almost any model.

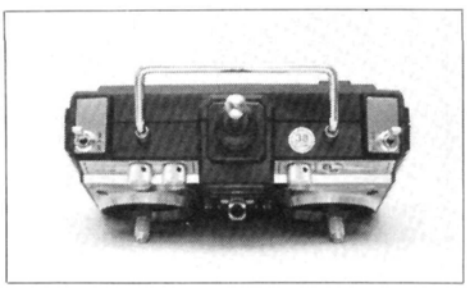
In addition to the hardware, the FP-5NH system has a well-illustrated 6-page instruction pamphlet describing each system element with isometric and exploded-view drawings. Particularly good are the transmitter and helicopter peculiar control drawings.

The heart of the new Conquest FP-5NH is the transmitter so let's start there. The FP-T5NLH is a mode II-type transmitter with helicopter features added to it, much like the new crop of transmitters with all the bells and whistles that pattern competition fliers are using. If you look at the front panel controls the 5NLH looks like a typical mode II transmitter—rudder and throttle on the left stick and elevator and aileron on the right stick. Both sticks have trim controls in the usual places and it's not until you look at the control knobs at the top front of the transmitter and the two switches at the top that you see terms like: "Revolution Mix" (up and down), "Pitch Trim," and "Throttle Rate."



FP-5NH airborne package all-up weight is 12 ounces.

On the back of the case there are three screw driver adjustments labeled "Idle Up" and "Adjustable Servo Throw." These are the helicopter-oriented controls and their use is intimately associated with the model helicopter manufacturer's instructions and placement and orientation of linkages. Thus, I can only speak generically about the use of the controls and why the adjustable parameters were selected. For example, when the main rotor starts to turn, say, clockwise because of torque forces, the helicopter fuselage wants to turn in the opposite direction or counterclockwise. To prevent this, we use a tail rotor whose pitch direction and speed of rotation is used to cancel the main rotor torque. Revolution mixing controls this on the transmitter. Revolution mixing performs this operation simultaneously with the throttle control and is necessary to fly a helicopter. This is but one example of four special features of the FP-5NH. The conventional elevator/aileron stick is used to fly the helicopter at a given throttle setting up and down and right and left through the linkages attached to the main rotor. A full description of the nuances and techniques leading to successful helicopter flying requires far more pages than I am allotted and in fact there have been many books written on the subject which may be purchased at your local hobby store. I know, because I just recently bought one and I will shortly obtain a helicopter to wring out the FP-5NH.



Top view showing helo adjustments on front and helo switches on top.

Rear view of transmitter—note three helo adjustments at the top, clip-in battery at bottom.

In summary, the FP-5NH is another excellent radio in the Futaba Conquest series of radios. It is well made, performs to specifications, and is specifically designed for helicopters as evidenced by its many features. For further information, please contact Futaba Corporation of America.

Charlie Kenney, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

Futaba Corporation of America, 555 W. Victoria St., Compton, CA 90220. ■

Skyote
As in Coyote

An American home-built with Jungmeister appeal.

by BUDD DAVISSON

SO...the editor calls and says, "We need another screaming biplane for the cover. What've you got?"

I knew the deadline was already a week past and he'd have to take my word for it, so I said, "How about one of my favorite little home-builts, the Skyote?"

"Yeah, great! Get it in by yesterday." And he hung up. Without being there I knew he then summoned the staff into a circle and asked if any of them had ever heard of a Skyote. Again, I knew none probably had.

What he didn't know is that there are "screaming biplanes" and there are screaming biplanes. And then there is the Skyote. Semi-obscure and as cute as a double-swept, out-riggered gear pipe can be, the Skyote is very nearly in a class by itself.

How do you class an airplane that feels almost like a Jungmiester, does aerobatics better than that ancient Teutonic champion but putters through the

sky at only 100 mph? and is three sizes smaller than tiny? Like I said, it's almost in a class by itself.

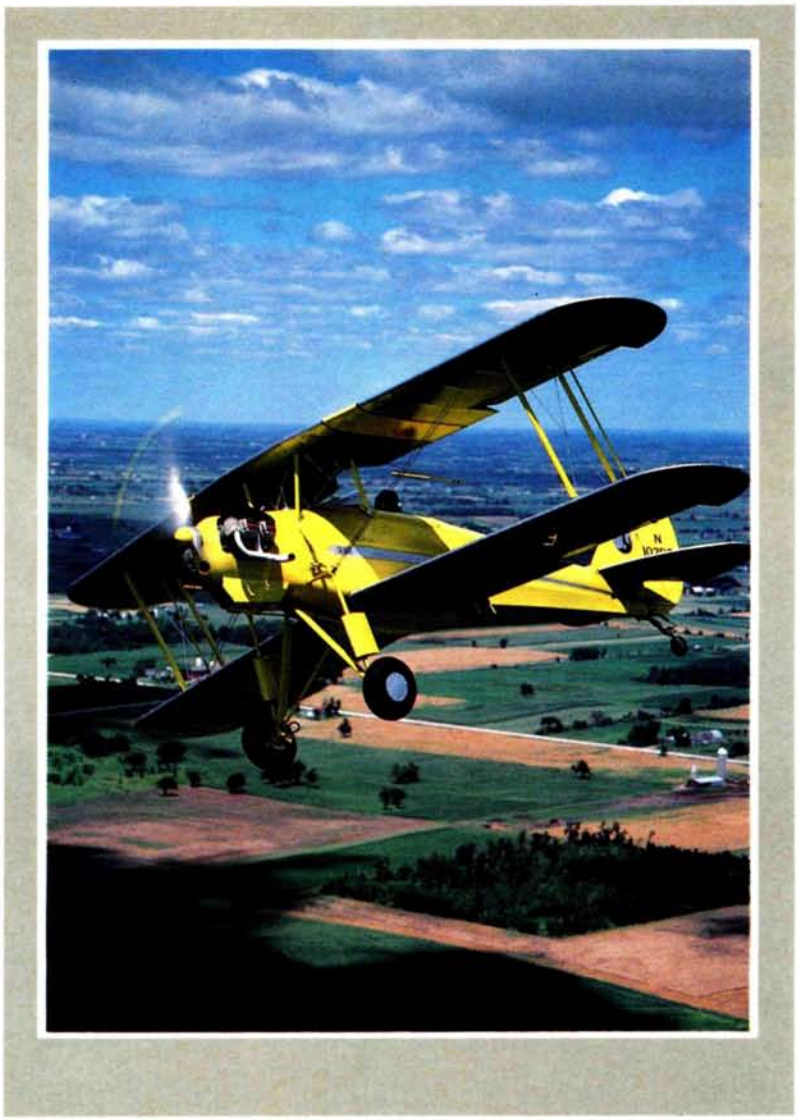
The Skyote is the three-dimensional offspring of Pete Bartoe, a Colorado designer who almost never does the expected. For instance, the Skyote and the Bartoe Jet Wing came out back to back; he went right from one to the other with a year-long yacht trip in between. In one jump he went from an anachronistic biplane to a machine that looks like a *Star Wars* gnat with a Cessna Citation jet engine nacelle stuck in its nose. The Skyote was investigating fun while the Jet Wing was a research vehicle probing into the so-called "blown wing" concept. The jet engine's exhaust was ducted over the surface of the wings and supposedly created lift in the process.

The Skyote isn't an airplane that has leapt to the home-built forefront. In fact, it's one of those machines that live in home-builtdom almost as a cult diety. It's known well only by a few, but those few are rabid about it. If you don't believe that, look at the foam around my mouth the next time we meet. I'm definitely rabid about the Skyote.

Before we climb into the Skyote's cockpit, let's get a couple of things straight. First, the name rhymes with coyote (as in Wiley C.). Second, even though I've busted those wirey little critters with every kind of cannon available, I never once heard anybody outside of a movie theater or East of Colorado call them coyotes as in ky-yote-ees. In my part of Nebraska they was just ky-yotes. But then maybe we didn't know better.

I came to know the Skyote at Oshkosh a few years back

I was just getting ready to bring the tail up and the airplane leapt into the air.



and it really set me on my ear. First, as you may know, I'm a Bucker freak. The Jungmiester is always on the top of my favorite airplane list (next to the Bearcat). And the Skyote left me thinking I'd just spent half an hour tossing an old-fashioned German biplane around. But it definitely ain't German. And it certainly is neat.

As you walk up to a Skyote, you can't help but be taken by its funky appearance. To many, it's a little too funky, but to those who live and breathe fabric and butyrate, the Skyote's appearance captures something that seems familiar. And it should seem familiar because bits and pieces of the appearance represent just about all the really classic airplanes.

Bartoe knew what he was doing when he laid out the Skyote's lines. He wanted something that looked old, like a midget antique. So, the outrigger gear was thrown in as tribute to WACOS. The nose was kept tiny on purpose and the cylinders of the 100-horsepower Continental were exposed, in keeping with the theory that the more there is hanging out in the wind, the more authentic it is. The tail surfaces continue the antique theme and the double swept wings do a lot more than ease access to the tiny cockpit...they help it snaproll like a Bucker.

I was first introduced to the Skyotes at Oshkosh a few years back. I had seen pictures of it, but it wasn't until laying eyeballs on the actual article that the true scale of the bird came home. Even though it has a longer wingspan than a Pitts or some other highly loaded baby bipe, its lines are much finer and give it a more petite feel. Also, the long gear keeps the skinny fuselage a little higher off the ground than you'd expect, which reduces its visual bulk.

Boarding the Skyote is interesting, if only because it uses a technique you don't see outside of a corral. Because the cockpit opening is so small, the accepted method of getting your leg into it is to swing it over the turtle deck like you're boarding a horse. It also helps if you bring your elbows together in front of your stomach as you insert your body into the cockpit. If you don't, you have a devil of a time getting them back inside.

Oddly enough, once you're in and the doors are pulled up, you don't feel scrunched at all. A bit confined, maybe, but not restricted in any manner. There is also a vague prairie dog feeling because only your head is sticking out of the cockpit, like a little critter looking around at whatever it is they look around at.

"Hot, brakes, throttle cracked," I hollered and the little Continental caught on the first blade. We were using the grass alongside one of the runways, so I brought up the throttle and squeased one brake to head it back toward the far end. As I trundled through the grass I could feel the airplane rocking gently back and forth on the narrow gear.

Nose into the wind, I brought the power up and almost immediately started laughing. I was just getting ready to bring the tail up and the airplane leapt into the air. With at least 10 knots on the nose, the airplane left the ground at around 40 mph indicated, so our ground speed was practically nothing. Neat!

With only a hundred horsepower I expected a mediocre climb, but I was wrong. Really wrong. The best climb speed is supposedly something like 55 mph, but the angle was steep enough to make me drop the nose a little just to see where I was going. The best part of any flight is takeoff (and landing, and akro, and...) because the sense of leaving the ground-bound world behind is so pronounced. In something like the little Skyote, where you're out in the wind and its great performance gives the feeling of the ground dropping away, the juices really start flowing.

When you fly a strange airplane you don't really know what you've got until a fair amount of flailing around has been done. In some, though, the second the wheels leave the ground and flight passes through the wings and into your hand, you know what kind of steed you're riding. That's the

(Continued on page 83)

Radio-Control

by ART SCHROEDER

THE GOLDEN YEARS. I read recently in another modeling publication that Peter Pointgetter (age 43 or so) was on his way out as a national modeling force and big contest winner. And this was the result of Tommy Turnaround and Hector Heading (both under 20) emerging as big winners. It seems that many feel youth will prevail and that, somehow, the younger one is, the better one is for R/C flying. It all sets me to wondering—does age really make a difference in our ability to fly radio control airplanes?

Our reaction time and eyesight (particularly depth perception) are at a peak in our earlier years and deteriorate later in life, but that doesn't necessarily give an overwhelming edge to the young fliers. There are compensations; age brings experience, knowledge, expertise and a certain calm approach that replaces some of our younger physical skills. There is no reason in this world why an older R/Cer can't win at contests or be the local field's "hotshot" pilot.

Of course, one must ply their sport regularly. As with many things, R/C flying requires practice. Since so much of controlling a flying object in a three-dimensional environment involves timing and the ability to stay ahead of the aircraft, constant practice is necessary. With practice, as long as desire and drive remain, it matters not what decade of life in which one is flying. You, *anyone* can still be a winner.

But, in time, all of our national champions fall to be replaced by, usually, a younger flier. Some retire, but many continue competing with reduced results. As I see it, only the results diminish—the flying by these former winners remains consistently fine. Why don't they win? Perhaps judges see them too often and become jaded at their excellence; perhaps judges simply feel that older fliers can't do that well. Whatever the reason, we all tend to favor youth and that inherent favoring may well create bonus points. In today's R/C competition it only takes ½ a point or a split second to create a new champion.

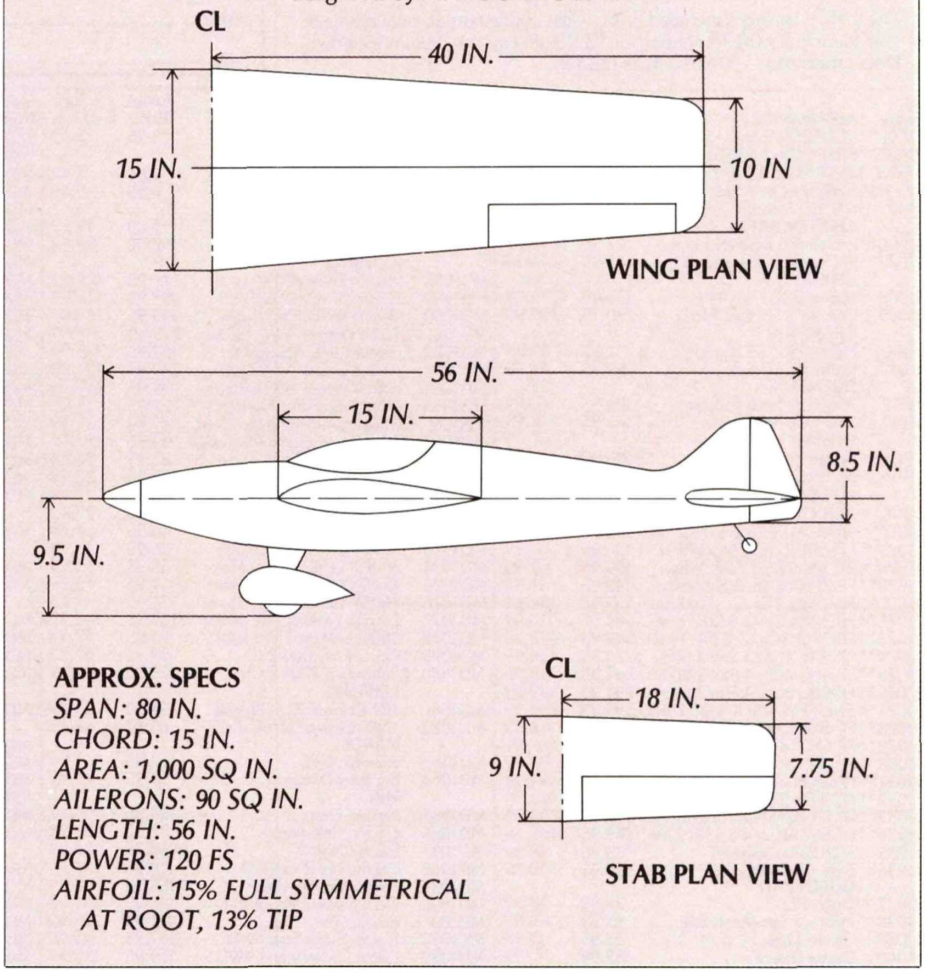
Indeed, everyone thrills at a Nats win involving a teenager. I do as well, but I wait for the chance to shake the hand of the *oldest* Nats champ. There are a lot of older candidates out there with the ability to win. All they need is the drive to do what they did before!

After all, Jack Nicklaus was a winner in golf last year, Willie Shoemaker is still driving horses home to the winner's circle and Phil Neikro is still winning major league baseball games—not to mention that Bill Miller of South Dakota was able to score in the middle of the pack at the most recent NMPRA Championships. When one does that in R/C Pylon Racing (one of our most demanding events) at age 73, one has really done something.

That's the beauty of radio control modeling; it has room for everyone, of any age and with many facets that constantly challenge.

EYEBALL SUPREME

desgined by ART SCHROEDER



APPROX. SPECS

SPAN: 80 IN.
CHORD: 15 IN.
AREA: 1,000 SQ IN.
AILERONS: 90 SQ IN.
LENGTH: 56 IN.
POWER: 120 FS
AIRFOIL: 15% FULL SYMMETRICAL AT ROOT, 13% TIP

News

Single Stick Again

I've talked about single-stick transmitters on many occasions in the past, only because I consider that mode of flying the best of all possible R/C worlds. With single stick, all primary controls are actuated with one hand—the dominant, most effective hand one has. Those flying Mode II (aileron/elevator on right stick) are actually flying a form of single stick. Moving the rudder to its appropriate position on top of that right stick only makes rudder-use easier and more effective. But, I'm not here to convince you to change; just don't knock it until you try it.

I am here to report that one of my single stick problems has been solved. For years, I've clung to my Pro Line and Kraft Signature systems with Chidgey sticks, sticks no longer available. I still feel that the Chidgey single stick is the best I've ever flown, but there's a new one that gives nearly the same feel. And this fine stick is coupled to a radio system that has all the latest technology. Add to that a transmitter case that's just the right size and shape for single stick fliers. The system is the new Futaba Single Stick PCM.

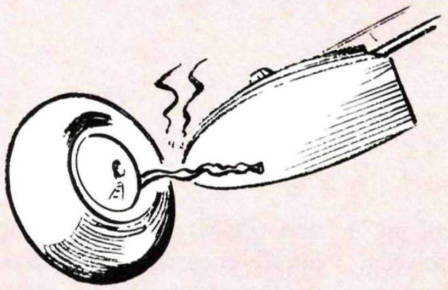
This is a system that does everything but cook! It includes pulse code modulation (PCM) that surely helps in our interference-ridden airways, a count down—or up—timer, tachometer, a variety of mixing features, adjustable rates, servo reversing, frequency modules and all the whistles and bells. There's enough there to boggle one's mind. Someday, I may understand all the features enough to take full advantage. For the moment, the silky smooth single stick controls are enough for me. Charlie Kenney will fill you in on all the technical data in a future "Control Tower" radio review; and I'm sure all you single stick freaks out there will want to have a long

(Continued on page 95)

Hints & Kinks

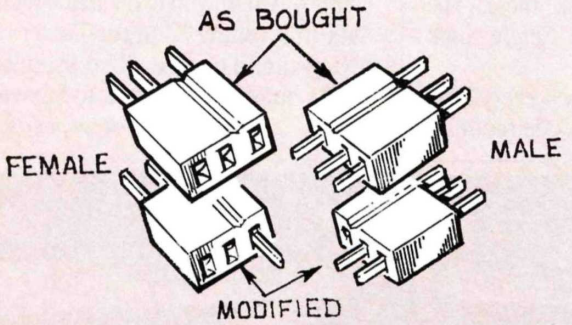
by JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News,** 632 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.



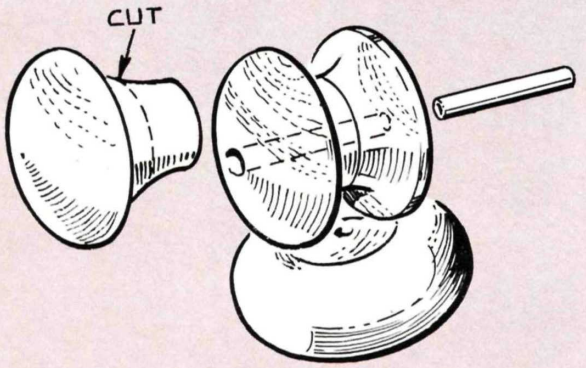
Those delightful Trexler wheels have a character all their own, but sometimes the inflation stem develops the annoying fault of collapsing so that the walls stick together, thus preventing the tire from being inflated or deflated. Set a MonoKote iron to the medium setting, then carefully apply gentle heat to the stem which will cause it to unstick and resume its normal appearance.

Rich Anderson, Everette, Washington



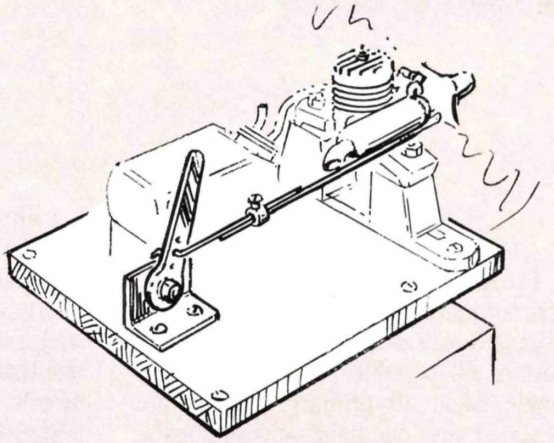
Deans connectors are a fine product and even though the pins have asymmetric spacing and an indicator groove, it's still just possible to force them together with the wrong pins mating. There is a simple remedy. With a pair of pliers extract one pin from each of the male and female components and exchange them as shown. Easily done and very effectively stops wrong connection.

Alex Schneider, Clearlake, California



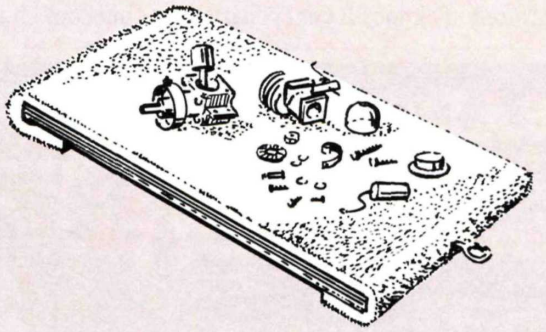
Need "old timer" wheel hubs? Two cabinet door knobs made of wood, cut, glued, and bushed with metal tube, can accept any smooth contoured tire. Nothing looks worse than a vintage model with modern wheels! Here is the name of a well-known Californian whom we are **really** thankful to see back in circulation after a terrible accident.

Dan C. Lutz, Fallbrook, California



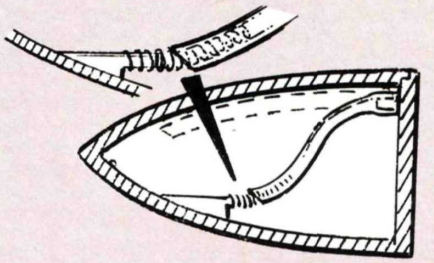
A positive throttle control is needed on an engine test stand. Simple to make from metal scraps around the shop—a piece of angle, metal strip, a self-locking nut, and perhaps a cork or gasket material friction washer will do. Your columnist suggests a two-piece pushrod locked by a wheel collar to accommodate various carburetor positions.

John Barbieri, Howard Beach, New York



This workboard has given its creator much satisfaction—any handy piece of board covered with a smooth dark-colored outdoor-type remnant. Parts and small tools stay put and visible, while dropped parts do not ricochet to the floor.

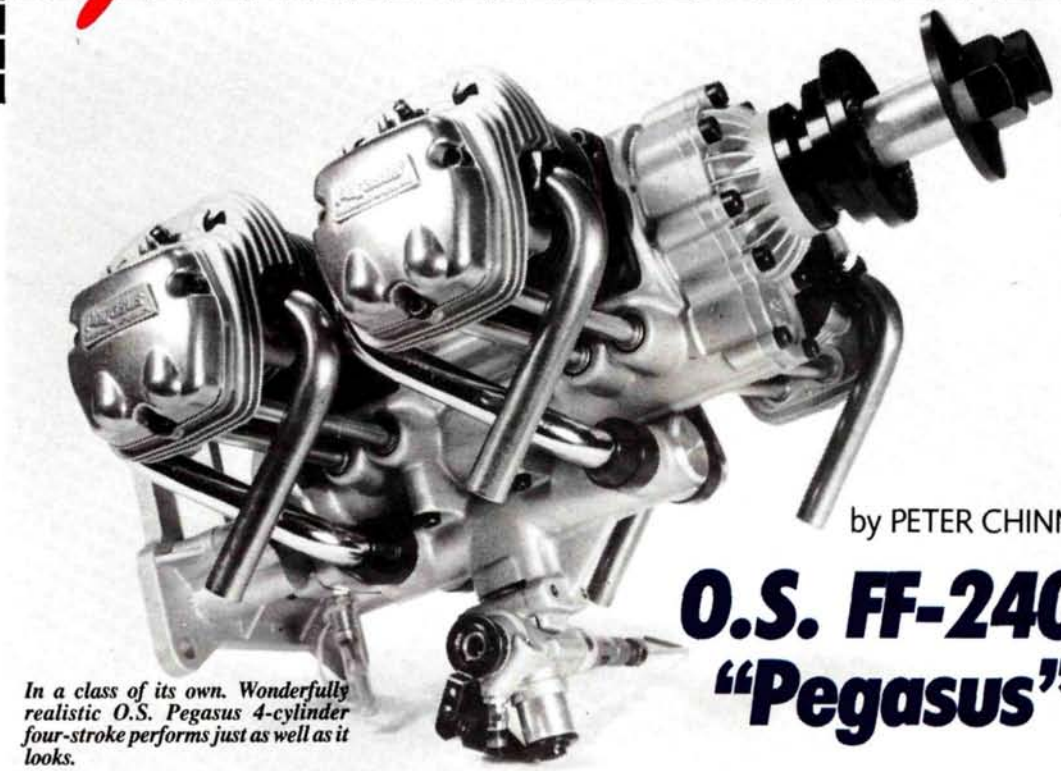
Al Szarejko, Buffalo, New York



This Hoosier has trouble with his D&R Power Pod in which the suction end of the fuel line is plugged onto a position-keeping molded pin—except that his slips off the pin and flips up above the fuel level! His cure was to remove the pressure spring from below a lighter flint, then twist it firmly onto that pin. The fuel line is then slipped over the spring during assembly of the tank. Tricky, but it works! Cut pickup end of line at an angle to prevent blockage by the spring.

Bill Mitch, Hebron, Indiana

Engine Review



In a class of its own. Wonderfully realistic O.S. Pegasus 4-cylinder four-stroke performs just as well as it looks.

by PETER CHINN

O.S. FF-240 "Pegasus"

SPECIFICATIONS

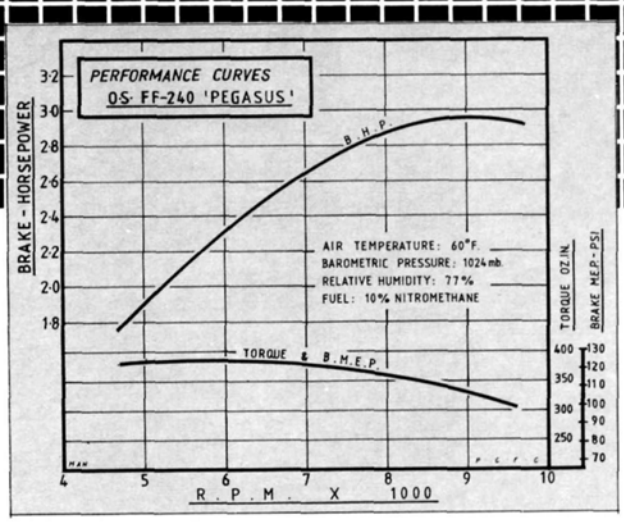
Type: Horizontally-opposed four-cylinder glowplug-ignition four-stroke-cycle with pushrod-operated overhead valves. Three bearing crankshaft supported in five ball-bearings. Twin ball-bearing camshaft. Throttle type carburetor with choke valve.
Checked Weight: 2.19 kg (4.83 lb) including firewall mounting plate.
Displacement: 39.81cc (2.429 cu in.)
Bore: 24.0 mm (0.9449 in.)
Stroke: 22.0 mm (0.8661 in.)
Stroke/Bore Ratio: 0.917:1
Nominal Compression Ratio: 8.5:1
Performance Data (as tested):
Power Output, gross: 2.95 bhp at 9,000 rpm
Torque, gross: 385 oz-in. at 6,000 rpm
Equivalent b.m.e.p.: 124 lb/sq. in.
Specific Output, gross: 1.21 bhp/cu in.
Power/Weight Ratio (with mount): 0.61 bhp/lb.
Manufacturer: O.S. Engine Mfg. Co., Ltd., Osaka 546, Japan
U.S. Distributor: Great Planes Model Distributors Company, P.O. Box 4021, Champaign, IL 61820.

IN THE PAST, a question we were frequently asked was: "What is the best engine on the market?" Back in the earliest days of commercial model engines, it was just possible to answer such a question. Nowadays, the different uses to which engines are put are so numerous, and the demands of such applications are so diverse, that no single motor could ever be regarded as "the best" in every respect.

But, now and then, an engine comes up which proves to be so impressive, in so many ways, that one is fired with a new enthusiasm. It is then but a short step to thinking: "This is the best."

One such engine is the O.S. FF-240 "Pegasus" four-cylinder four-stroke engine, the first examples of which were released last summer and which we first described in a brief review in the July

Compact cast aluminum firewall mount is entirely adequate, such is the incredible smoothness of Pegasus flat-four layout.



Right: Power curve shows nearly 3 horsepower 9,000 rpm.

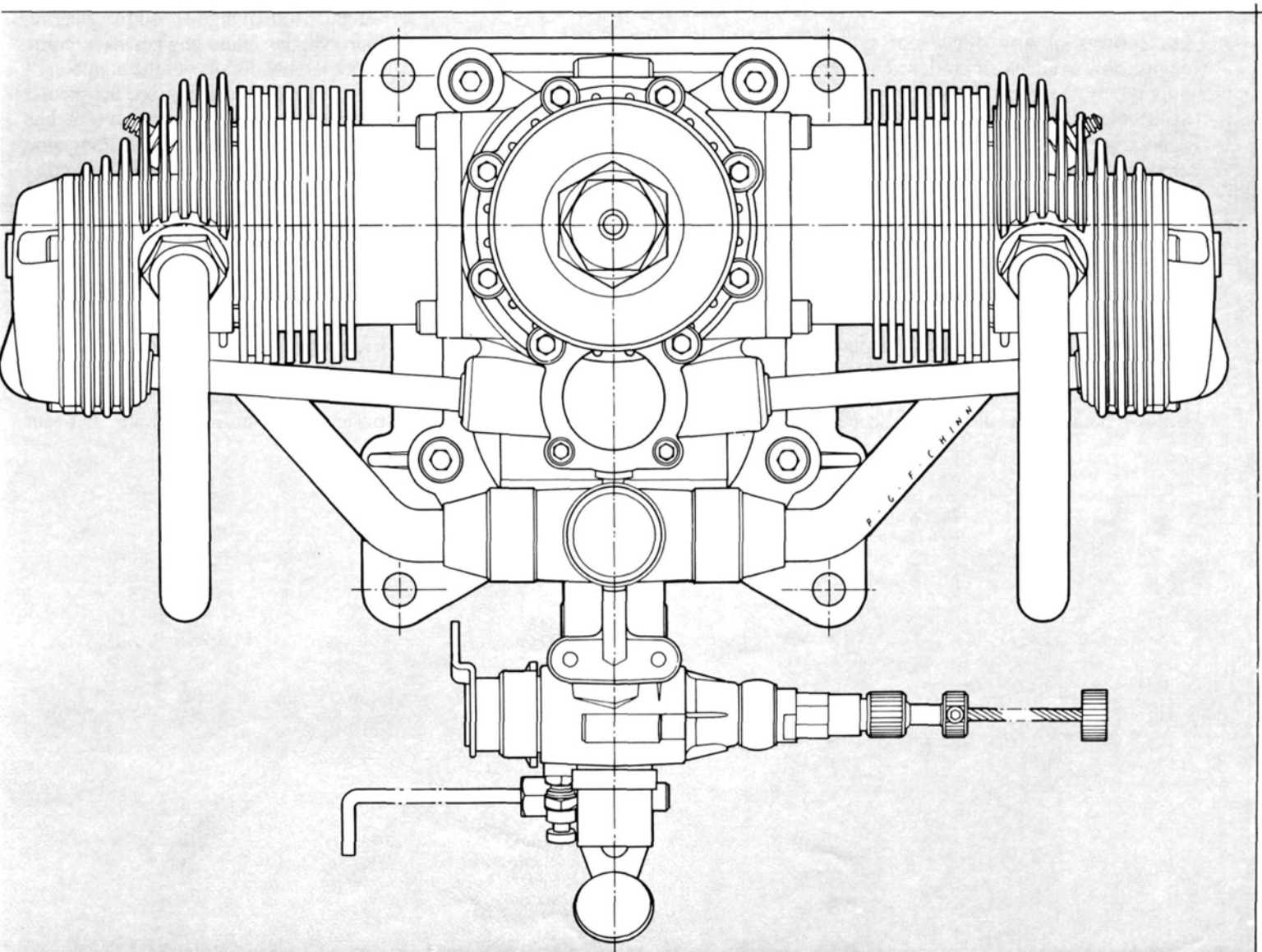
Below: Full-size front view shows easy access to mounting lugs.

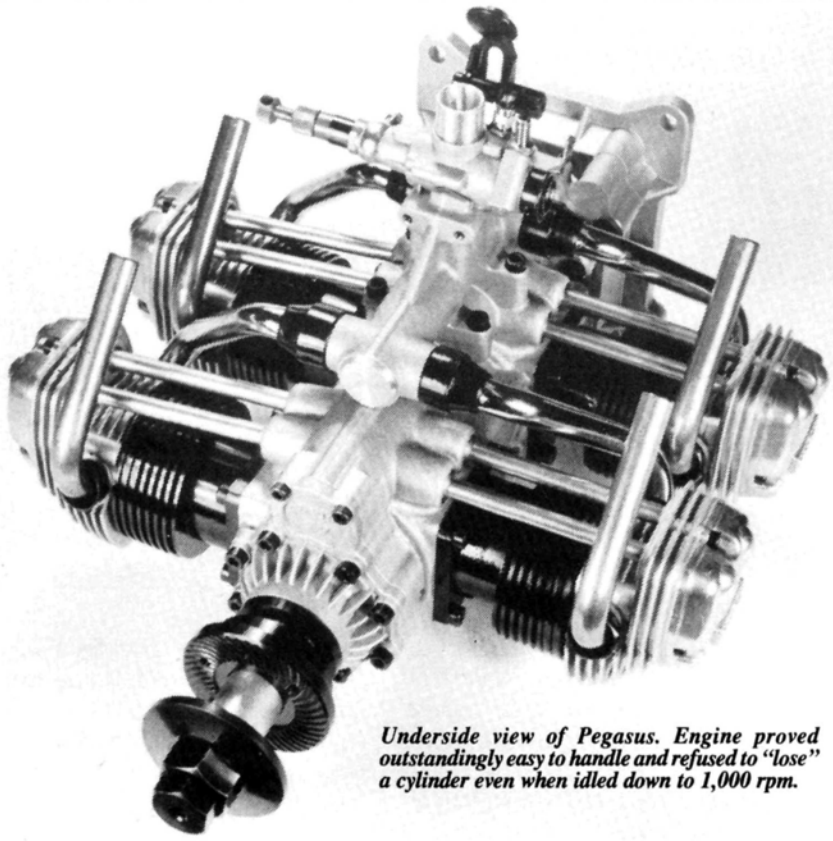
1986 issue of *M.A.N.*

Of course, the Pegasus starts off with a built-in advantage in that it is the first and, so far, the *only,* horizontally-opposed four-stroke-cycle model aircraft engine to be put into regular commercial production. The sheer realism of the engine marks it out as something special, but many of its operational virtues stem from the very fact that it is a genuine flat-four four-stroke.

For example, it is outstandingly smooth running and has an incredibly low idling speed—the lowest, by far, that we have discovered in thirty years of testing throttle-equipped R/C engines. It also has an uncanny ability (to an extent unequalled by any multi-cylinder engine handled to date) to always keep firing on all cylinders. Moreover, our test motor refused to be goaded into detonation, or "ping," and never "backfired" on starting. In fact, it was extremely easy to start and to handle.

Nor is all this achieved at the cost of reduced power. While the Pegasus did not deliver the highest peak brake-





Underside view of Pegasus. Engine proved outstandingly easy to handle and refused to "lose" a cylinder even when idled down to 1,000 rpm.

> ***It ran freely, showing no tendency to overheat.***

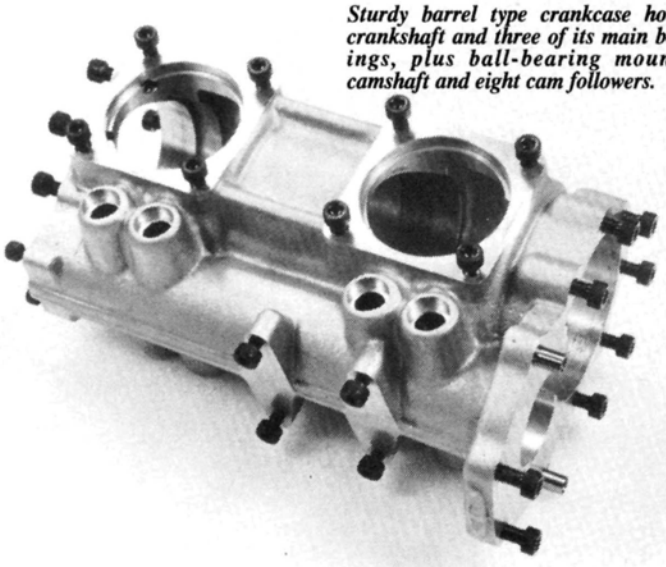
horsepower of any 40cc four-cycle engine now available, it produced, more importantly, the torque necessary to turn, at healthy rpm, the large prop sizes appropriate to the relatively large scale models for which it is intended.

The Pegasus is not the first multi-cylinder four-stroke engine to be tested for this series, but it is the largest, most powerful, most sturdily made and most practical. Its only multi-cylinder rivals, at the present time, are its five-cylinder stable-mate, the O.S. FR5-300 "Sirius" radial of 3.037 cu in. displacement, and the Saito FA-325R-5 of 3.243 cu in., also a radial. Both of these engines are scheduled for future full test coverage.

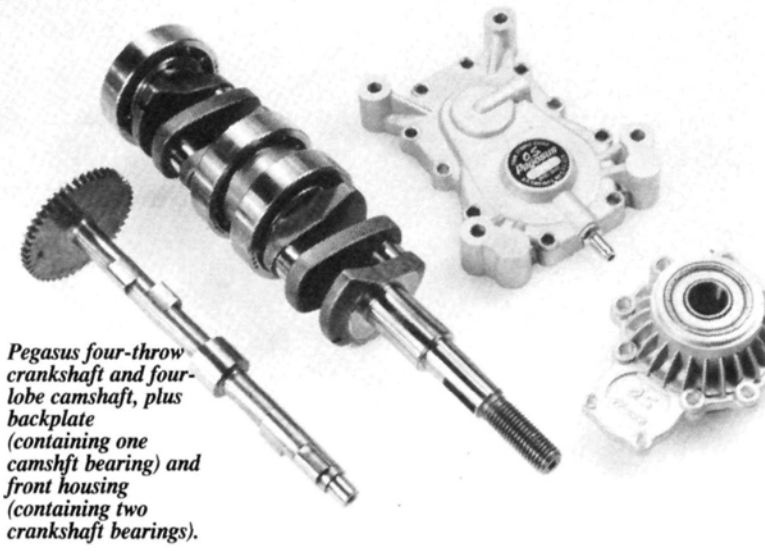
The design and development of the Pegasus obviously owe much to the O.S. Gemini Series of flat-twin four-strokes, which began with the original FT-120 model introduced in 1979 and which currently includes three models of 1.22, 1.62 and 2.43 cu in. displacement. Similarities will be recognized—along with its many unique features—in the following description of the design and construction of the Pegasus.

CRANKSHAFT & MAIN BEARINGS. Four-cylinder engines having an in-line (rather than opposed) configuration, may be of the two, three or five bearing type. That is to say, there may be just one main journal at each end, or there may be an extra main journal in the center, or there may be extra journals between each crank, as in most modern engines. In early low-powered four-cylinder automobile engines, it was not unusual to have just two bearings but, in the interests of greater rigidity, three bearings quickly became the norm. It was recognized, at that time, that five bearings were even better, but this meant lengthening the shaft and, consequently, the engine itself, thereby increasing size and weight. Modern high-speed five-bearing four-cylinder inline engines have come about largely because of the adoption of lower stroke/bore ratios: i.e., the greater distances between bore centers has lengthened the shaft and, at the same time, created the space for a bearing between each crank. So far as weight is concerned, this is offset, to some extent, with these short-stroke engines, by reduced cylinder height.

For horizontally-opposed four-cylinder engines, on the other hand, irrespective of stroke/bore ratio, three bearings are fully adequate. With two cylinders on each side of the crankshaft (instead of four in line) the flat-four

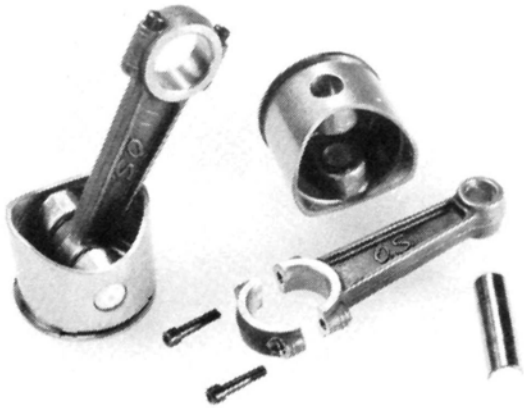


Sturdy barrel type crankcase houses crankshaft and three of its main bearings, plus ball-bearing mounted camshaft and eight cam followers.



Pegasus four-throw crankshaft and four-lobe camshaft, plus backplate (containing one camshft bearing) and front housing (containing two crankshaft bearings).

Crankshaft is made in two parts joined by half-lap coupling at center, using hardened steel collar with massive ball bearings each side.



Pegasus features conventional short-skirted ringed aluminum pistons and forged bronze conrods with "full-size" type detachable bottom-end bearing caps.

engine is much shorter. The axes of each opposing pair of cylinders are offset (i.e., one behind the other) only by the need for the crankpins to be placed 180° apart, separated by the flying web of a short, sturdy crankshaft. With compactness and lightness on its side, as well as superior balance, it is not difficult to see why, over the past forty years, the horizontally-opposed four- or six-cylinder engine has become so much more popular than the inline type for light aircraft.

Our data table for the O.S. Pegasus indicates that its crankshaft is supported in five ball bearings but it is still, strictly speaking, a three bearing type. This is because, in addition to having the front end supported in two ball journal bearings, the center main journal is also carried in two ball bearings. The reason for the latter is that, in following conventional high-quality model engine practice by having the crankshaft entirely supported in ball bearings, it has been necessary for the shaft to be assembled from separate front and rear components, joined at the center journal.

A simple but highly effective method of coupling the two components is used. The divided center journal of the hardened steel shaft is some 20 mm diameter, but each half has a precisely ground semi-circular step, 6.45 mm deep, so that the two parts form what is known as a half-lap coupling. This is surrounded by a hardened steel collar, 28 mm o.d. and 9.5 mm wide, all three parts being so precisely finished as to fit together smoothly, in perfect alignment, without backlash.

On each side of the collar is installed a massive 20x37x9 mm 11-ball steel-caged ball journal bearing. A similar bearing supports the rear end of the shaft, while the front end is carried in a 13x28 mm 8-ball steel-caged inner bearing and a 3/8x7/8 in. 7-ball steel-caged shielded outer bearing.

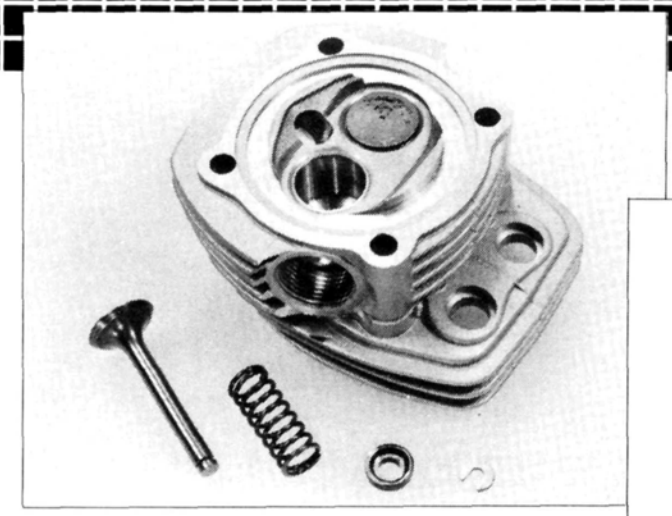
Cylinder components showing pressure-cast head with bronze valve guides, hard-surfaced steel sleeve, machined and anodized finned jacket and polished rocker-box cover.

CAMSHAFT, TIMING GEARS & BEARINGS. The camshaft lies immediately below the crankshaft, from which it is driven by spur gears. It has four cams, i.e., each one operates two cam followers of opposing cylinders. The inlet and exhaust cams have similar lifts (1.78 mm measured) but the exhaust cams have a slightly different profile, their opening flank being more curved. The result of this is that the exhaust valve opens quite early and, in marked contrast to most other engines, the inlet period is actually some 50° shorter than the exhaust period. (More about valve timing in a moment.)

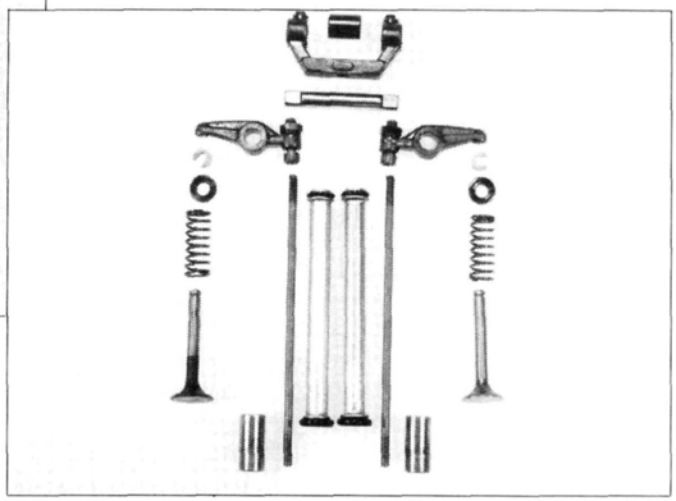
As in the O.S. Gemini Series flat twins, the camshaft has a large diameter integral timing gear which directly engages the crankshaft pinion. The gears have 48 and 24 teeth respectively and are both of hardened steel. Following normal O.S. practice, the camshaft is supported in ball journal bearings at both ends: a 6x17 mm bearing at the front and a 9x17 mm bearing at the rear.

VALVE TIMING. As noted above, the Pegasus has the unusual feature of an inlet period that is much shorter than the exhaust period. Measurement of the test engine (with tappet clearances set at the practical cold minimum to extend the periods to their maximum), indicated that the inlet valve opened at approximately 10° before top dead center and closed at 35° after bottom dead center; an inlet period of no more than 225° of crank angle. The exhaust valve opened at 80° before BDC and closed at 15° after TDC for a 275° period. It will be noted that valve overlap (the period during which both valves are open and during which the escaping exhaust gas, by creating a negative pressure in the cylinder, is helping to draw the fresh charge through the inlet valve) is no more than 25° of crank angle. This compares with 80° or more for most modern single-cylinder model four-strokes.

Lengthy overlap periods are of value in achieving high top end power (modern racing automobile engines, for example, may have as much as 120° of overlap) but there is a price to pay in lack of flexibility: a lowering of volumetric efficiency and torque at low speed and less reliable idling. An engine like the Pega-



Left: Cylinder heads are similar to those of larger displacement single-cylinder FS-90 and Gemini-160 twin. Below: Valve train for one cylinder.



sus, designed to power scale models, is not required to turn at eleven or twelve thousand rpm. Much more important is an ability to turn a twenty-inch prop at a reasonable speed, plus a low idle and absolute reliability with no tendency to "lose" a cylinder, either when idling or when the throttle is re-opened.

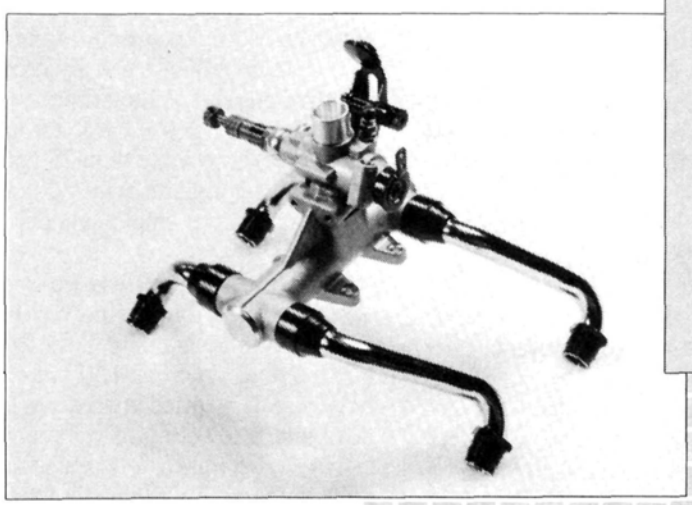
CRANKCASE. This is of the barrel type into which the crankshaft, complete with its center and rear bearings, is inserted from the back. The camshaft is likewise inserted from the rear, its front bearing being located in the front end of the case. The crankcase is a quite complex machine-finished aluminum alloy casting to which the four cylinders, the front housing, back cover and inlet manifold are bolted with no less than forty hexagon socket cap screws.

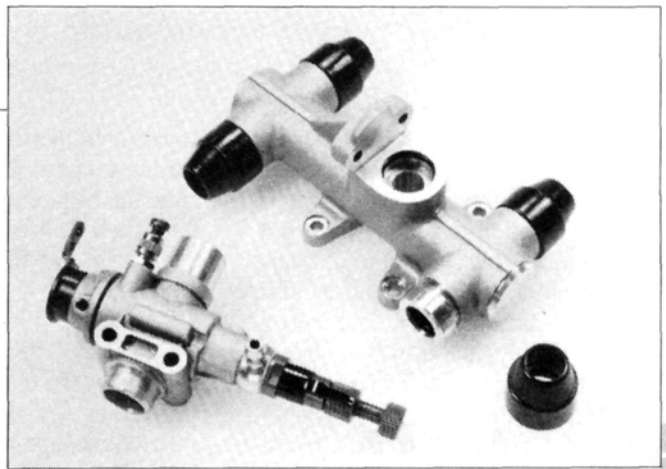
The front housing contains the two front crankshaft bearings and is secured to the case with ten cap screws; eight 3.5 mm, plus two 2.5 mm at the base. The backplate contains the rear camshaft bearing, is located by two tubular steel dowels and is also fixed with ten cap screws; eight 3.5 mm, plus two 3.0 mm which pass through the dowels and are secured with nuts. The backplate incorporates the four drilled lugs by which the engine is attached to its firewall mounting plate.

CYLINDERS. The cylinders are the same as those fitted to the Gemini Mk.II version of the FT-120 flat twin. The steel-linered machined aluminum bar stock cylinders have a black anodized finish, are spigoted into the crankcase and each is secured, via a rectangular base flange, with four 3.5 mm hex socket cap screws.

PISTON & CONROD ASSEMBLIES. These, again, are the same as those of the Gemini 120 Mk.II. The flat-head, short-skirted pistons are cut away to clear the crankwebs and ball-bearings at BDC and are equipped with single conventional compression rings. They are fitted with 6 mm full-floating tubular wristpins located by PTFE pads. The drop-forged bronze connecting-rods are also the same as those fitted to the 1.6 cu in. Gemini-160 twin, featured in our test report in the October 1985 issue of *M.A.N.*

CYLINDER HEADS. The heads are produced from the same excellent castings as those of the Gemini-160, but are machined differently. The ports and valve throats are unchanged and, in consequence, these are relatively large for a 10cc cylinder displacement. The valves, in fact, are just about as large as it's possible to accommodate within a 24 mm





Left: Inlet assembly showing adjustable automatic mixture control carburetor. Above: Carb is easy to adjust and very reliable. Simple cast aluminum inlet manifold works remarkably well in evenly distributing mixture to cylinders.

cylinder bore and a bathtub combustion chamber. They operate in bronze cup type combined guides and seats.

The heads are symmetrical and can therefore be used on both left and right cylinders and are secured to the cylinders with four 3.5 mm cap screws spaced at 90° intervals. A recessed 0.2 mm (0.008 in.) soft aluminum gasket is used between the head and liner flange.

VALVE GEAR. The stainless steel valves, as noted above, are large for a 10cc cylinder displacement. They have 10.4 mm diameter heads and 3.0 mm diameter stems. The rocker arms are of investment cast chrome-molybdenum steel, case hardened, and have the usual screw adjusters. They are pivoted on a 4 mm diameter hardened steel rocker shaft that is mounted in an investment cast steel frame. The rocker ratio increases lift at the valves to approximately 2.25 mm.

With the rocker-box covers removed, the rocker arms are sufficiently exposed to allow easy checking of valve clearances. The attractive polished aluminum covers, with "Pegasus" nameplate, are attached with three cap screws.

In the usual O.S. manner, the eight pushrods are enclosed in tubular covers which are located by O-rings between the camshaft housing and underside of the rocker box. The cam followers are 6 mm diameter by 13 mm long.

CARBURETOR & INLET MANIFOLD. The carburetor is an adjustable automatic mixture control type and is of a design exclusive to the larger O.S. four-strokes at the present time. Fuel metering is via a sleeve which rotates with the throttle barrel and uncovers a tapered slot type jet as the throttle is opened. The location of the sleeve opening, relative to the jet, is adjustable through a device working on the cam-and-peg principle. This allows fine adjustment of the idle mixture to be carried out very simply. The carb has the usual idle speed adjusting screw (with gland nut), an adjustable throttle arm and a banjo type union that allows the fuel inlet nipple to be rotated to the most convenient position. The carburetor has a bore of 7 mm and an effective venturi area of approximately 19 sq. mm. A self-reopening choke valve is fitted to facilitate easy priming with a cowled engine.

The carburetor plugs vertically upward into a simple cast aluminum intake manifold having side outlets, fore and aft, to the intake pipes. The carburetor is located rearward of the mid point between the outlets to the front and rear pairs of cylinders—presumably as a result of experiments aimed at achieving more balanced charging of the front and rear cylinders. The manifold is secured to the bottom of the crankcase with four 3 mm cap screws.

INLET & EXHAUST PIPES. The four inlet pipes are formed from 7 mm i.d. copper tube and are chromium plated. Machined aluminum adaptors are screwed into the inlet manifold outlets and these have internal O-rings into which the inlet pipes are inserted to make gas-tight joints. A neat finishing touch is the synthetic rubber boot that covers each joint. *(Continued on page 48)*

About Those Engin

by JOE WAGNER

SO FAR, just about all the mail I've received in response to this column has been about old-time motors. That seems odd. Most model engines in use today are modern ones—and despite the fact that nearly all of today's motors are better-made than those of yesteryear, they do have their problems.

Perhaps not enough of my readers know that I'm happy to answer their questions—about *any* type of two-cycle model engine. I do almost all of my own flying with sport-type model engines, so I'm in a good position to help newcomers to our hobby with any motor problems they're likely to have. If you've got engine troubles of any sort, though, let me hear from you!

Model airplane engines have been mass-produced for well over 50 years now, and you'd think that by this time all their problems would have been solved. Nothing really new in basic two-cycle design has come out since 1950, except for refinements in materials and porting arrangments. So, all in all, today's model motors are remarkably reliable and trouble-free.

Yet some failures do occur. Engines overheat, corrode, break connecting rods, or won't respond right to throttle changes. There are reasons, of course, for all these problems. Let's look at some of them.

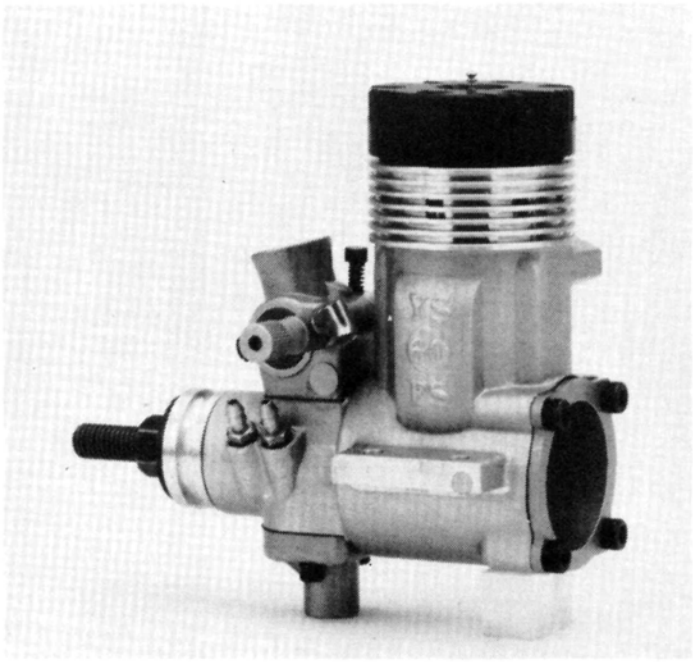
One unsuspected cause of several engine troubles is the glowplug. Too many of us take our plugs for granted, and buy them purely on the basis of price or availability at the hobby shop. Unfortunately, glowplugs are not like light bulbs: completely interchangeable provided they'll screw into the socket.

Jerry Price, of Royal Oak, Michigan, wrote to me a while ago about a glowplug test program he performed. Briefly, he took several glowplugs of different brands, plus a few of the same make and type, and put them one after another in one of his favorite engines. He used the same fuel and propeller throughout, and did the whole test series in a single afternoon, to assure air temperature and humidity consistency. Jerry ran his engine with each plug in turn, taking accurate rpm readings each time. Then he repeated the test sequence again, to confirm his results. He had expected to find some differences between the various plugs; but he was surprised that they were so great. The best plug delivered about 20% higher rpm than the worst. Not only that: there was as much as 5% variation in output between apparently identical plugs of the same make!

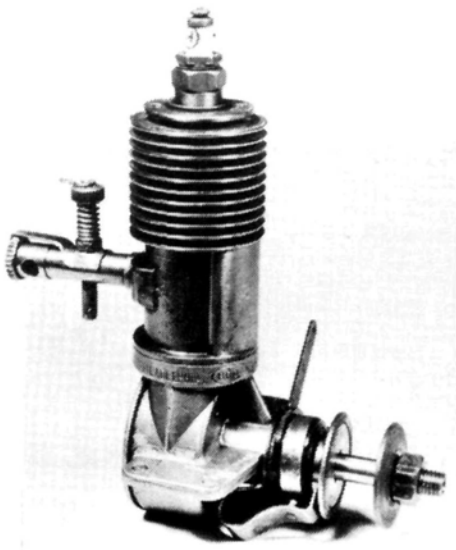
I repeated Jerry's tests with a motor and glowplugs of my own, and got approximately the same kind of results.

There's a good reason for this variation. The way a glow engine runs depends very much on its "timing": the position of the piston when the fuel charge ignites. With a given fuel mixture, it's the glowplug that determines when ignition begins. If it happens too soon, while the piston is still on its way up, power is lost. And even worse, starting gets difficult, the engine runs hotter, and the connecting rod takes a beating.

The ideal glowplug has just the right size, shape, and composition of filament to ignite the fuel mixture a few thou-



Although the YS60 will probably run on any glowplug, extracting optimum performance from it means proper plug selection.



Spark-ignition engines didn't suffer from the consequences of improper plug use as do glow engines.

What is the ideal glowplug?

sandths of an inch before the piston reaches top dead center (TDC). It takes about half a millisecond in a typical .40 R/C engine for the fuel to burn after ignition. If it begins to ignite immediately before TDC, maximum pressure on the piston head will develop just after TDC, and maximum power output results. But if ignition happens too soon before TDC, the pressure peak comes before the piston arrives at the top of its stroke. Then the fuel's energy is partly wasted pushing backward against the piston's motion.

What is the ideal glowplug, then? I wish I could tell you! But unhappily, the type of plug that gave me the best results was not the same as worked best for Jerry. You see, each engine and glowplug is different. Even motors of the same make and model can have small dimensional differences because of manufacturing tolerances. Depending on the piston-cylinder fit, one motor may have better compression than another. Fuels vary; modelers use different types and sizes of propellers; temperature and humidity are also variables. The glowplugs themselves are not necessarily identical, even in a single manufacturing batch. They are assembled one at a time, and the position and exposed length of the filament may be different in two plugs made one right after the other.

That's why you have to determine the ideal plug for your own requirements yourself. You can get a rough idea of how suitable your plug is by the way the engine acts on starting. If the motor tends to kick back, the plug is probably too "hot" for your engine, fuel, and prop combination. If the plug is too "cold," the motor will lose power when you disconnect the battery, perhaps even stopping. But to really "fine-tune" your engine and find the ideal glowplug for it, you'll need a tachometer. (An excellent "tach" for model engine work is the Tachmaster II made by Ace R/C, Inc.* It's an easy-to-use, easy-to-read analog type tachometer, with three scales: 0-5000 rpm, 0-10,000, and 0-25,000. Other tachs on the market have only two scales, lacking the Tachmaster II's highly useful mid-range. Another advantage of the Tachmaster II is its push-to-read switch, which eliminates the problem of absent-mindedly leaving the instrument on when it's not in use, thereby running down its 9-volt battery.)

You can make any glowplug behave as if it's too "hot." Just fuel the engine with a high-nitro racing blend, turn the needle in until the rpm peaks, then tighten it a little further. Lots of modelers do just this. It's probably the commonest way of ruining an engine. Trying for extra power with racing-type fuel and a super-lean mixture will only make your motor run very hot, increase wear on all the moving parts, and put a tremendous strain on your connecting rod.

Plug element and idle bar are the main operatives for reliable and consistent engine runs.

Experienced modelers know that high-nitro fuel is simply not necessary for most types of model flying. Cox Hobbies Inc.*, manufacturer of the highest-powered ½A engines in the world, no longer recommends their high-nitro racing fuel for most of their engines. They now advise using their milder "Super Power" fuel whenever the temperature is over 60°F.

In my own model flying I never use any higher than 10% nitro fuel except for ½A motors—and I add extra castor oil to all my glow fuel, regardless of brand, for better lubrication and cooler running. That doesn't hurt the power output a bit. In fact, most of the time my oilier stuff gives better performance than stock fuel, probably because of lower friction losses.

As for leaning out the needle valve to the ultimate rpm level; theoretically this does boost the horsepower output. But for every kind of R/C model except pure speed types, you get much more useful thrust by using a larger prop, keeping rpm down a bit, and running a rich mixture.

Consider full-size aircraft engines. When a pilot wants maximum power, as in takeoffs and climbouts, he sets his mixture *rich*. The extra fuel flowing into the engine's cylinders acts as an additional coolant, almost like water injection, and helps prevent detonation. The only time a lean mixture setting is employed is during cruising flight at part-throttle, to increase the range the airplane can fly.

With model engines, fuel economy isn't as important. We install big tanks in our R/C models as a matter of course. The small increase in fuel consumption due to a slightly rich mixture is insignificant compared to the protection the motor receives from excessive heat, rapid wear, and heavy loads on the wrist pin and connecting rod.

In my next column I'll go into further detail about connecting rod problems, and also talk a bit about engine corrosion; its causes and cures. In the meantime, send me your questions about model engines, enclosing an SASE, and I'll do my best to answer. (I reply to most inquiries directly by mail rather than in this column, to minimize delay in getting the answers back to you.)

Joe Wagner, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of companies mentioned in this article:*

Ace R/C, Inc., P.O. Box 511C, Higginsville, MO 64037.

Cox Hobbies Inc. 1525 East Warner Avenue, Santa Ana, CA 92705. ■

Colonel Thacker is no stranger to jets, being a full-scale jet jock himself; he puts his hands to the latest Byron kit offering.

Byron Originals

KFIR C-2

Israeli "Top Gun."

by COL. ROBERT E. THACKER

THE ISRAELI Kfir is without a doubt one of the most sophisticated weapons systems among the nations' inventories today. Britain is now flying their experimental Delta Canard; France flew their Rafael at the Farnborough Air Show in the summer of 1986; the Swedes, of course, have their SAAB 37; and the Israelis even have a follow-on to the Kfir that they'll be flying this summer.

All of these new fighters utilize the Delta Canard concept. The Kfir is such an outstanding weapons system that our own Navy has just purchased 20 and our air force is going to modify the F-15 with canards.

What does this canard concept give us that the other aircrafts do not? The canard smooths out the exit and entry into maneuvers. It also makes the low-level operation of the aircraft much smoother; but the big plus is the 10% leeway that it gives for air speeds in the landing and take-off phase of flight. It allows you to take approximately a 14° attitude in your landing configuration. Evidently, the canard design keeps the air molecules glued to the top of the wing and prevents so-called stall. Along with all of this Delta Canard revolution, Byron Originals* has a new fighter that has been ready for distribution for over a year, but Mr. Godbersen, owner of Byron, test-flies each aircraft before it is released. He directed that the flight control systems be made more responsive and crisp. The kit was held off the market until he was satisfied.

Several pre-production kits were sent out to modelers like you and me for testing and evaluation. When modelers' recommendations came back, Byron Originals made many changes. Gone are the elevators and the aileron concept. Gone are the torque tubes and quick disconnects, and gone are the moveable canards. Ronnie Kemp of Washington State is primarily responsible for the flight dynamic changes!

Among the important changes that were made is the adoption of an elevon concept, with the servos in the wings and the direct pushrod connections to the elevons. That's a no-slop setup. Many other minor changes were made to improve the aircraft, which now has been exclusively flight-tested.

Enough of history. What really is a Byron kit? You assemble the components, drop in your engine and radio, cover the lifting surfaces of the aircraft, paint, and go fly! It's as simple as that. Let's go over each component.

THE KIT. The fuselage comes to you in three pieces. All you do is wash it in soap and water, glue the three pieces together (they're all indexed), and your fuselage is finished. Our fuselage, I hate to say, had no pinholes, not one.

ASSEMBLY. The wings are pre-molded foam; all you do is lightly sand and you're ready to cover—couldn't be easier. We used Coverite's* new Black Baron plastic film for our covering and found it to be

as advertised!

For power, we're using the new OS77. Byron is right, it's stronger than the Rossi 81, with 500 rpm more, about ½ pound static thrust—a big gob when you're looking for more go! The throttle response is outstanding and very easy to set!

For painting, you can't beat K&B epoxy. It's the standard. The only problem is that you have to blend it. We used white, blue, and black to get the tones we desired.

As we're using an elevon concept, you must have a guidance system that has this feature. I use an Airtronics* Championship seven-channel AM. If your system doesn't have an elevon feature, this company does make a little black box that you can attach to the receiver to give you the facility of elevons.

Follow the very complete plans. You get a half-scale that is well-done. Make sure that your CG is 8 inches in front of the fire wall. Pre-fit your motor mount, shroud, and fire wall before gluing the installation into your fuselage. Plastics have a way of working after they come out of the mold and you want to make sure that everything fits perfectly. I had to relieve a hole or two to get an easy alignment. If you absolutely have to change something in the plans, I suggest that you make your canards removable, particularly if you have to ship your model. Use the same concept as the wings attachment, and for your main canard rod, use 5/32-inch piano wire and you're in like a burglar.

The Delta design concept proved to be steady and manageable at all airspeeds.

Don't fiberglass-and-resin your flight surfaces because it will add a pound more to the aircraft, of which *lightness is next to godliness.* Don't change the flight control throws from those of the plans until you become accustomed to the feel of the aircraft. The roll rate will surprise you.

FLYING. For flight preparation, check your static thrust on the ground with a set of fish scales. You should have at least 9 pounds thrust—or

don't fly. Check and make sure your throttle barrel inside is *open all the way.* Make sure your controls are moving in the right direction and with the throws that are outlined in the plans. Please, not over ⅜ inch on either side of center line for your aileron action, and remember, ¼ inch up is neutral.

What are you to expect on your first flight? For takeoff, after steady-state airspeed, you must force the aircraft off the ground. This is because of the main gear location. (Incidentally, on our own Air Force F-102s, we had the same problem. After you're airborne, you can relax and your flight will be normal on climb-out.

Now for landing. On your downwind leg, bleed off your airspeed and carry about half throttle. With the Kfir and most Delta Canards, you'll find that you have to carry more throttle. Make your turn to final and keep much more throttle on than you're used to. Don't let the nose drop too much on the final and after you turn on the final, keep about one-fourth power on all the way down to touchdown. You'll find a Delta Canard (which has the thrust line above the C.G. and the main drag of the airplane) with power on, has a nose-down vector. So, as you reduce your power on the final, the aircraft will automatically raise its nose—watch out for this—and practically land itself. Don't get above 14° nose up unless you're practically on the ground. One word of caution: a Delta Canard won't conventionally stall, but that doesn't mean the aircraft won't fall! If you flame out (as all of us do) due to blown plugs and other reasons, stick your nose down 45° from the horizon and hold it there until you're ready to flare for landing. Don't start raising the nose, or the lift over drag curve goes almost straight up resulting in the aircraft zooming to the ground.

This is the best Byron kit yet. The decals are outstanding; if you build the C2, they're in Hebrew, indicating the scale details of the kit overall. You'll love the ease of construction, outstanding engineering and stimulating flight characteristics.

Get yourself a Kfir and come fly with me this summer at Byron's fly-in, the Paris Air Show of model airplane get-togethers.

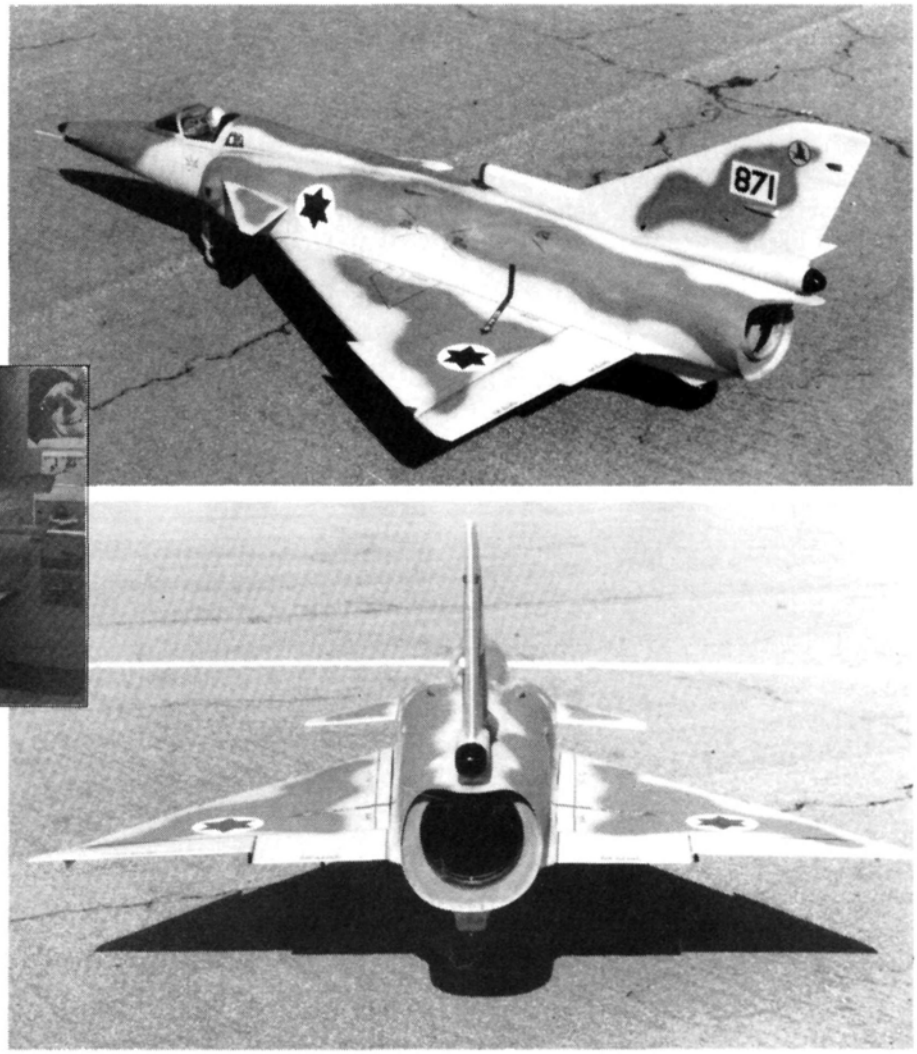
**The following are the addresses of the companies mentioned in this article:*

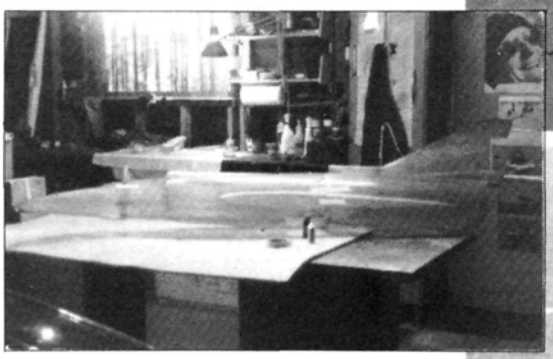
Byron Originals, Box 279, Ida Grove, IA 51445.

Coverite, 420 Babylon Rd., Horsham, PA 19044.

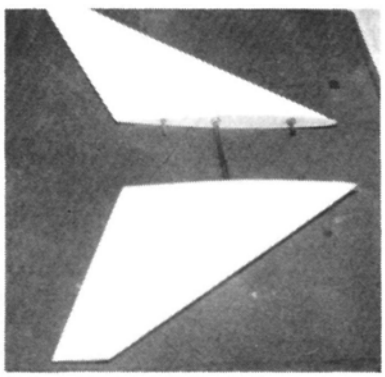
K&B Manufacturing, 12152 Woodruff Ave., Downey, CA 90241.

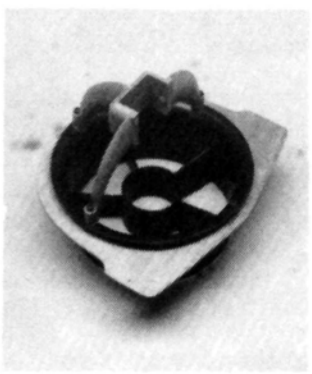
Airtronics, Inc., 11 Autry, Irvine, CA 92718. ■





A well-engineered kit, the fiberglass fuselage a piece of art.





Far left: Wing halves use plywood butt joints and are keyed. Left: Be sure to pre-fit fan shroud and mount before installing.

An eliptical wing and the basic Hots come together to form a hybrid flying machine!

by JOHN BECH-HANSEN

Hotselliptic

I FALL into that category of vaguely antisocial characters whose chief delight in the R/C hobby is building and flying small, lightweight, highly maneuverable and grossly overpowered airplanes which simply blow the wings off everything else in sight.

On this score it's hard to beat Dan Santich's highly popular Hots, the quintessential cheap thrills airplane. Yet, anyone who has flown R/C for more than a couple of years must get a bit jaded by airplanes with Hershey-bar wing profiles and fuselage shapes from the Minimalist school of design, with due respect to Mr. Santich, nevertheless.

Hence, the Hotselliptic. No, it doesn't much resemble a Hots, but it does borrow the one-piece construction, thick wing and basic moments and areas of the original. Naturally it's somewhat more time consuming to build than a Hots, but well worth the effort.

Not only is the Hotselliptic distinctive in the air, but it *flies* appreciably better than the Hots in many respects—somewhat faster in level flight; much more responsive in yaw; quicker and more precise in rolls; tighter looping; more violent in snap/spin maneuvers; and a little better in knife-edge flight. The only concession it makes to the Hots is in the landing regime, in that the Hotselliptic is somewhat *hotter*, if you will.

Incidentally, I seldom bother to put landing gear on any of my airplanes, and I suggest you do the same unless you simply can't live without it. My gearless Hotselliptic weighs only 2 pounds, 14½ ounces with a well-used Thunder Tigre .45 and Futaba* radio, and climbs straight up at a rate that is truly awe-inspiring.

The author came up with a nifty design using proven parameters.

CONSTRUCTION. First, a few notes: use cyanoacrylate adhesive exclusively and the lightest wood you can find; use plastic film covering, paint is much too heavy; build wing in your hands checking constantly for warps, no jig is needed.

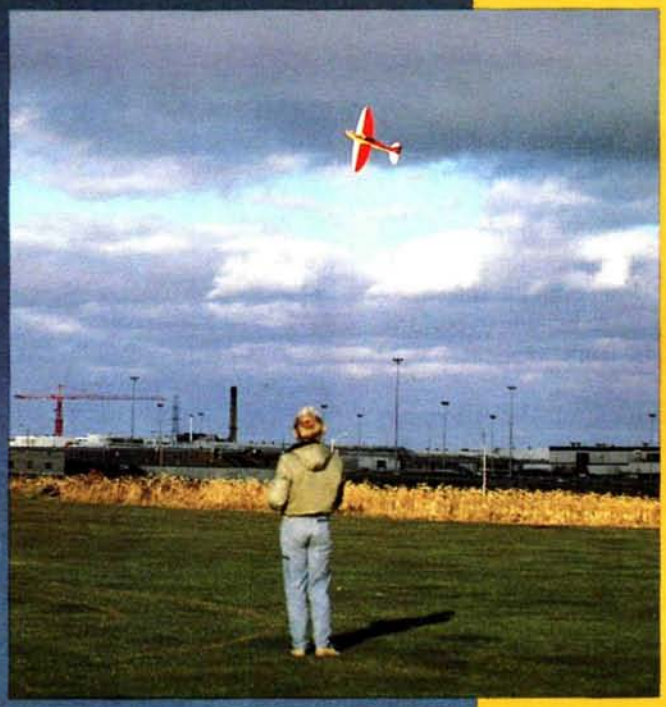
Start with the wing. Cut out all the ribs, taking special care when cutting the slots for the horizontal spar, which must be dead center on the ribs. Next, cut the horizontal spar out of a straight piece of wood (as it is nonstructural, you may cut lightening holes in it). Mark all rib locations on the spar. Glue on ¼-inch-square on top and bottom along the leading edge.

Slide the ribs onto the horizontal spar, using a T-square

along the back edge of the spar to ensure the ribs are glued on perpendicularly. Next, glue in the ¼-inch-square spruce spars after trial-fitting them first to ensure an identical curvature across the top and bottom of the wing.

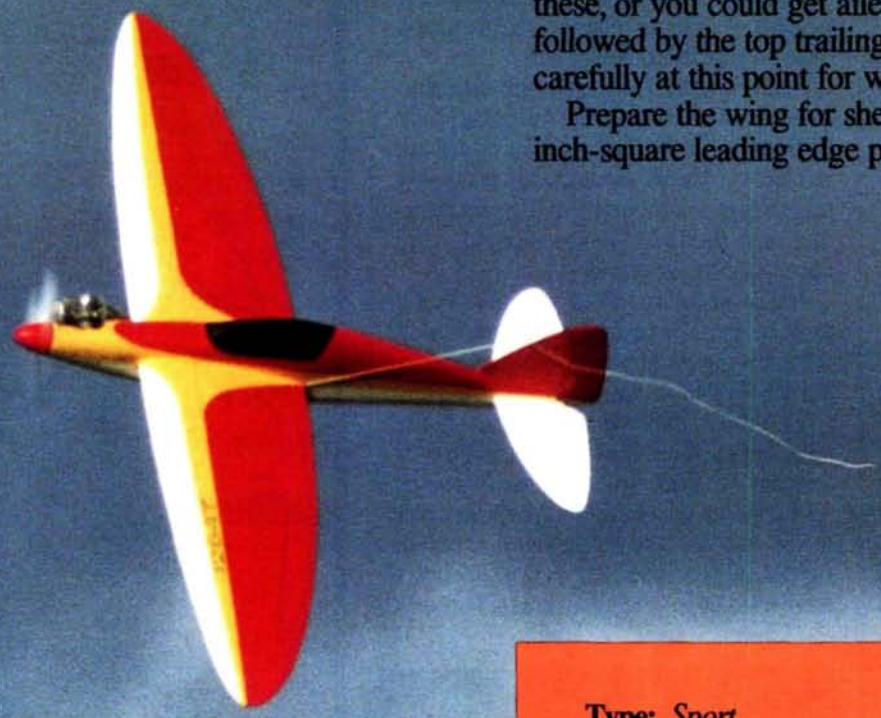
Use cyanoacrylate to glue the two aileron spars into place and sand as needed to fit the ribs. Make the trailing edges, chamfer them to a point along the rear edge, and mark rib locations on one of them. Cut out the ailerons and set them aside for later assembly.

Make the ⅛-inch wire torque rods and install them in the wing by breaking off the ribs where you have punched holes for the rods, cyanoacrylate the torque rod tubes into place, then re-bond the rib ends back into place.



Cyanoacrylate the lower trailing edge onto the wing ribs and aileron spar, add the two riblets 1A and epoxy them to the torque rod tubes (don't omit these, or you could get aileron flutter without them), followed by the top trailing edge. Check very carefully at this point for warps.

Prepare the wing for sheeting by sanding the ¼-inch-square leading edge pieces to a triangular

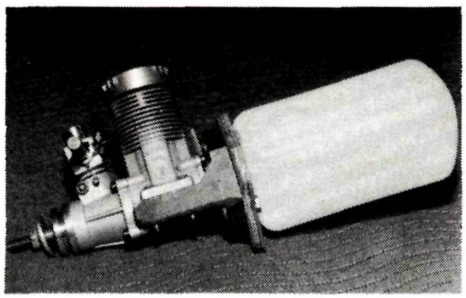


Type: *Sport*
Span: *54 inches*
Wing Area: *435 square inches*
Weight: *2.5 to 4.5 pounds*
Channels: *4*

shape, gradually tapering in thickness toward the tip, at which point the extreme LE should be sanded to a point.

The rest of the wing is straightforward and needs no explanation for the experienced builder. Don't omit the spar webs; that is, if you want to be able to perform full-up pullouts from vertical power drives.

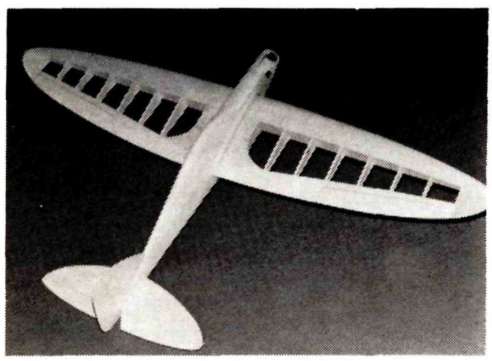
Make the ailerons from the various bits and pieces shown on the plan. Like the rest of the wing, they have a compound curvature which necessitates that you build them in your hands and not flat on a building board. Bevel the front edge of the ailerons to allow about half an inch of travel in both directions.



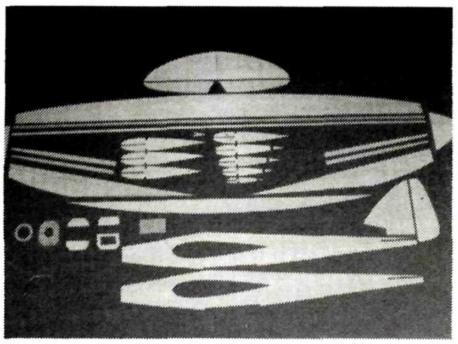
Setup of engine and tank to firewall is a necessary requirement.

Once the wing is finished you can start on the fuselage. Glue the various pieces of ½-inch triangle and ⅛x¼-inch to the fuselage sides where the taper toward the tail begins, raise the tail about 1¼ inches above the building surface, and squirt cyanoacrylate on the crack.

To join the wing and fuselage together, start by marking the centerlines of bulkheads F2A&B and F3A&B, as well as the centerline of the wing on top and bottom. Cyanoacrylate the four bulkheads onto the wing root where shown on the plan. Prepare the engine mount/firewall/tank assembly as shown in the photos. Note that the front end of the fuel tank is epoxied into a hole in the firewall.



Bare-bones structure is quite lightweight.



Pre-cut parts prior to assembly. Don't let the elliptical wing scare you—it's really quite simple.

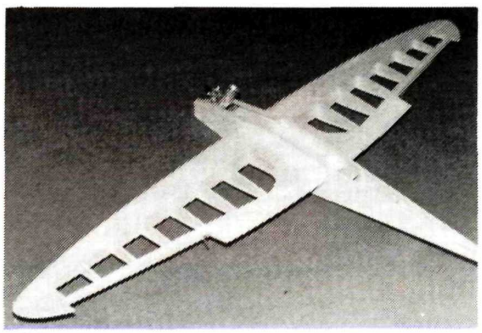
Slide the fuselage sides onto the wing, and tack-glue everything together. Be sure the engine is mounted with a propeller on it when you do this, so you can visually check thrust-line alignment. When everything looks good, squirt cyanoacrylate on all the joints.

Next, install the 1/16-inch-ply nose ring, shimming or trimming the front of the fuselage side as necessary to allow a little clearance behind the spinner.

The rest of the fuselage is self-explanatory. Be sure to hollow out the balsa block turtledeck, or the aircraft will come out tail-heavy. I also recommend wrapping masking tape around the wing root when you sand the fuselage to shape, to avoid damaging the sheeting.

Radio installation is a bit tight. You'll have to use a flat battery pack stashed in the left wing root (where it helps counteract the weight of the muffler).

FLYING. Balance the aircraft at the spar and use the following control throws: ailerons 7/16 both up and down, elevator 5/16 inch both up and down (you may wish to use less for test flights), and as much rudder as possible. The best propeller I have used on my .45 thus far is a Tornado Nylon 8-8, though any wood 9-7 will work well.

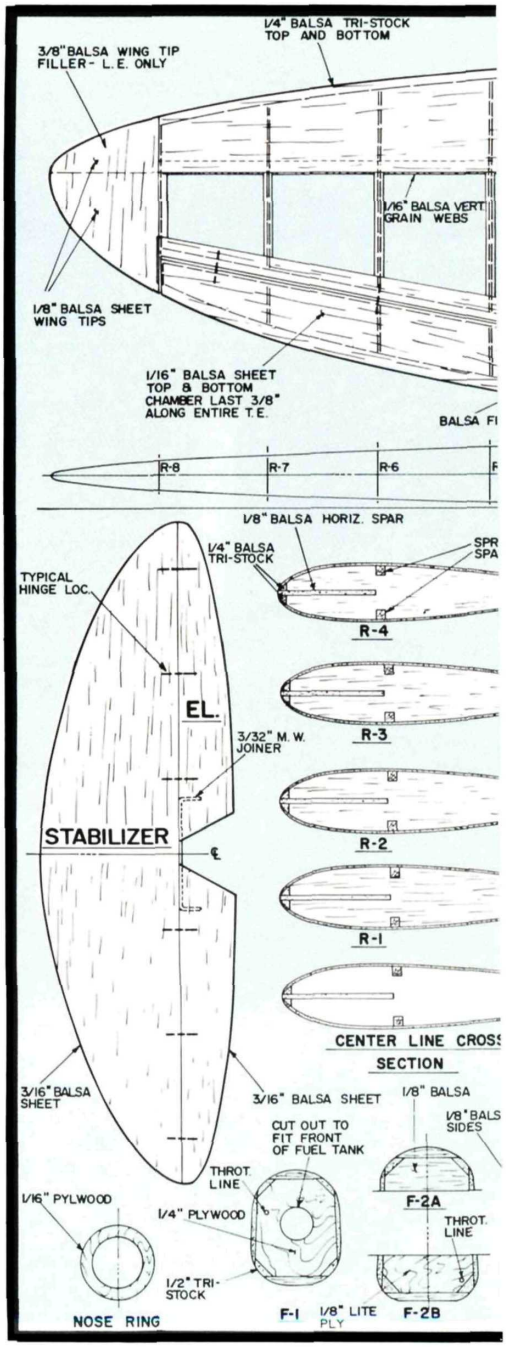


The wing is permanently attached to the fuselage.

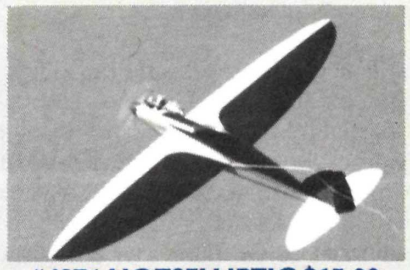
Be prepared to handle something a little more challenging than your average four-stroke Sig Kadet. The Hotselliptic is fast, very maneuverable, groovy, a practical size, and zoomy-looking. What more could you ask of an airplane expressly designed for showing off?

**The following is the address of the company mentioned in this article:*

Futaba Corporation of America, 555 West Victoria St., Compton, CA 90220. ■

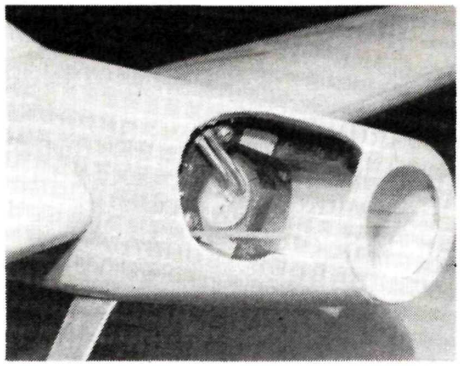


Order the Full-Size Plan!

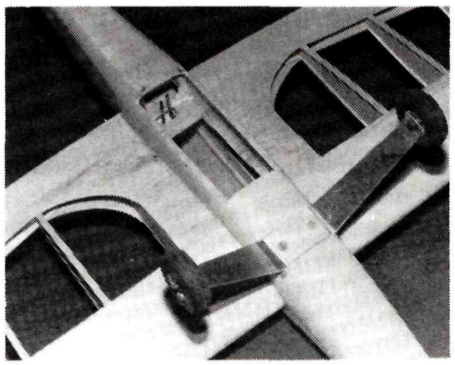


#4871 HOTSELLIPTIC $15.00

The Hotselliptic is a fast, high-performance sport design similar in size to the popular Hots. Having cleanliness in aerodynamic function, the Hotselliptic with a hot .40 engine will test your skills as a hot rock pilot. Although not for the beginner, this model builds fast and the elliptical wing is easy to construct. It is a one-piece design with a wingspan of 54 inches, area of 435 square inches, and uses a four-channel radio. One full-size plan sheet.

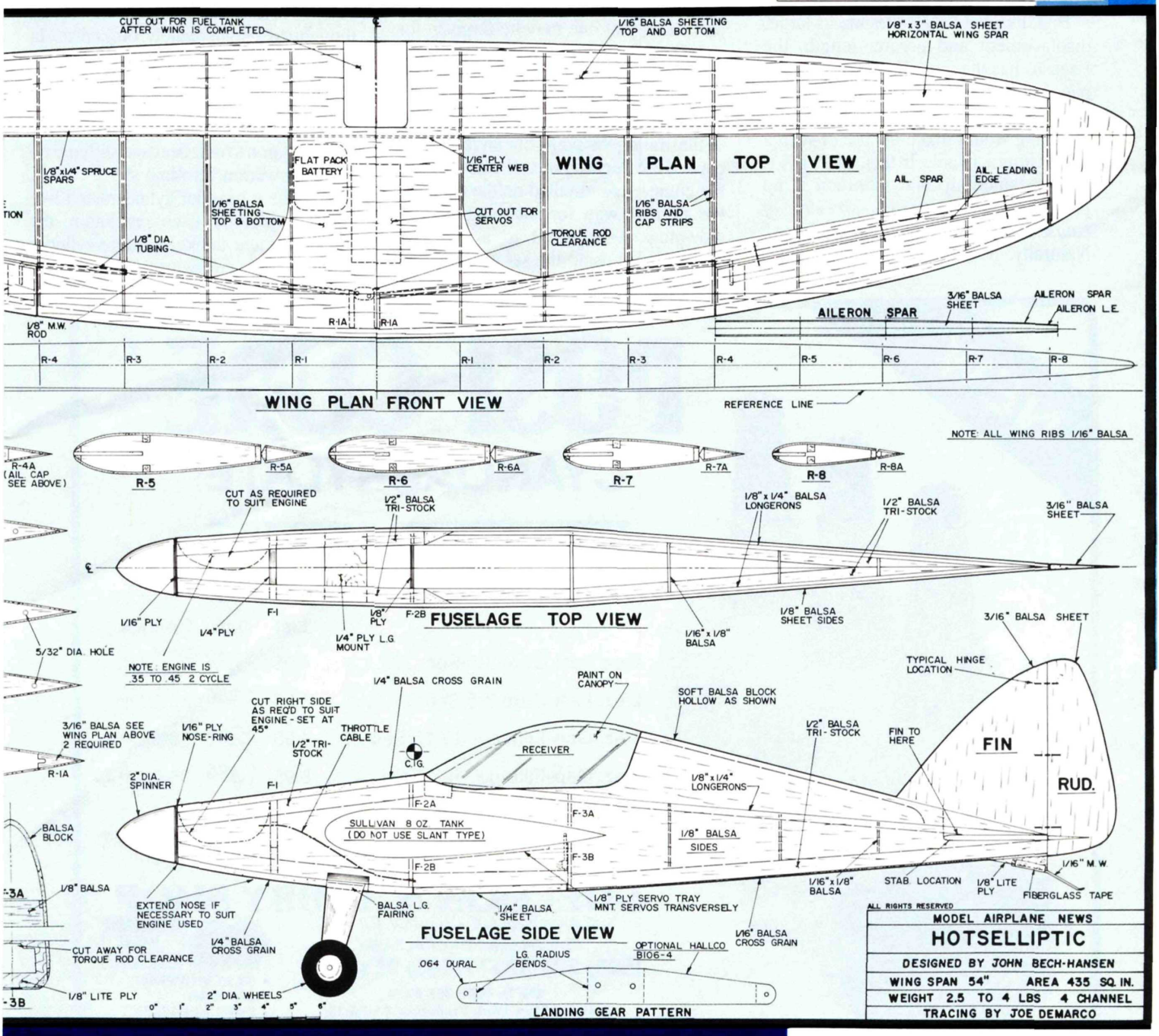


Nose shot shows engine mount/tank installed.



Access to radio is through lower hatch.

FOR ORDERING INFORMATION, SEE PAGE 121



O.S. FF-240

(Continued from page 35)

The exhaust pipes are formed from 8 mm o.d., 6.8 mm i.d. stainless steel tube. Inevitably, the exhaust pipes of model four-cycle engines eventually become unsightly with a coating of burnt-on oil, so stainless steel is a good choice of material as the pipes can be removed from the engine and restored to new appearance with steel wool and soap and water.

Connection of the eight inlet and exhaust pipes to the cylinders is via gland nuts that screw into threaded bosses in the cylinder heads. The pipes have flared ends which seat on aluminum gaskets and are backed with special narrow steel rings to ensure firm and even contact.

ENGINE MOUNT. Despite its larger displacement and greater length, the Pegasus has the same firewall mounting plate as the Gemini-120 and Gemini-160 twins. It might be thought that the extra overhang would make the use of such a mount impracticable. In fact, the Pegasus runs so smoothly that vibration is no problem with this mount—*provided, of course, that props are accurately balanced.* Naturally, it is important that, with a weight of nearly five pounds to support, the firewall of the model is of adequate thickness and strength and that it is very strongly integrated with the surrounding structure of the aircraft.

PROP DRIVE ASSEMBLY. The O.S. company has adopted a special locking system for the prop assembly of its larger four-strokes. This was fully described in our test report on the Gemini-160 (see October 1985 *M.A.N.*) and has been found to work very well. As befits an engine intended to turn large propellers, the Pegasus has a large diameter (39.5 mm) prop driver. This is secured to the crankshaft with a Woodruff key.

PERFORMANCE. A very comprehensive instruction manual is supplied with the Pegasus. In fact, it is so detailed and so full of advice on how to avoid problems, or how to deal with them if they arise, that one may be forgiven for supposing that innumerable pitfalls await the unwary. In fact, there is absolutely nothing tricky about operating the Pegasus.

Illustrating this point, our initial experience of the Pegasus was as follows. First, the engine was installed on the bench in the normal way for breaking-in. The glowplugs were wired to a common battery point using the set of leads and excellent push-on glowplug connectors supplied. A fuel tank and a throttle pushrod were added and the engine was fitted with a 20x8 Top-Flite prop. The fuel tank was filled with a straight break-in mixture of 20% castor-oil and 80% methanol.

We then followed the maker's pre-start procedure precisely, switched on the current to the glowplugs and swung the prop. The engine started immediately.

The Pegasus also responded instantly to a *standard* electric starter. Because its displacement is split between four .60 cu in. cylinders, the torque necessary to overcome the compression of one cylinder every 180° is not beyond the capabilities of a standard 12-volt Sullivan starter.

Naturally, with such an exotic piece of machinery, we were cautious about letting the Pegasus have its head until it was thought to be adequately broken-in. In truth, the Pegasus showed none of the symptoms commonly associated with an engine that might require an extended break-in period. It ran very freely, showed no inclination to overheat and suffered no loss of power on warming up.

Because it has four cylinders and two firing strokes for each revolution, the Pegasus (quite unlike a single-cylinder

(Continued on page 72)

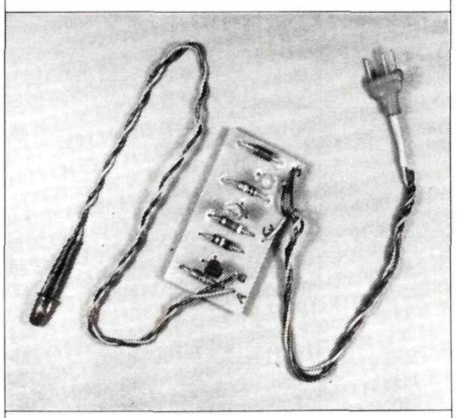
ADJACENT TRANSMITTER WARNING DEVICE

Avoid disaster at the field.

by FRANK MORIARTY

THIS DEVICE is designed to give a visual warning of another transmitter operating on the same frequency you are. It should be thought of only as an adjunct to the normal safety precautions taken before turning on your transmitter and not as a substitute. Used as part of the preflight and along with frequency flags, clothespins of various colors, or transmitter impounding, it will aid in the prevention of your airplane being shot down and other pit-area accidents. Operating from the power available from one of your unused servo outputs, it requires no batteries of its own, you simply plug it in. Installation and removal of this device are quick and easy, and it draws a minimal amount of current from the battery pack (.001 amp with the transmitter On).

I chose a visual warning over an audio one because of its low cost, compactness, low current drain, and relative ruggedness, and in consideration of noisy pit areas which can make audio devices useless. However, substitution of the LED warning device for an audio device can easily be made, although the audio device would have to be located off of the printed-circuit card.



Visual warning of an imposing signal is indicated by an LED, shown on the lower left of the above photo. Plug at top right can be used in any unused channel of your receiver.

The circuit can be constructed for less than $5. All components are of the everyday, garden-variety type, available from most electronic supply outlets. A kit is also available from F&M Electronics* at the address listed at the end of the article.

CONSTRUCTION.

1. Begin by making the printed circuit board, as shown in Figure 2. If you prefer, an etched and drilled printed circuit board is available (see Figure 1). Though the circuit is simple enough to be constructed on a breadboard, a printed circuit is recommended for ease of construction and reliability.

2. Using Figure 3 as a guide, mount and solder all components onto the printed circuit board. Use only an electronic grade of rosin core solder.

FIGURE 1

QTY.	ITEM	PART NO.	SOURCE	COST
1	Printed Circuit Board	111-1	**	$4.95
1	Servo Connector	N/A	***	Varies
2	Transistor, Q-1 & Q2	2N4401	*	$0.23
1	Capacitor, C-1, 1.0 mf, 10 volt	P2021	*	$0.31
1	Diode, D-1	1N4002	*	$0.08
1	Resistor, R-1 100K ohm, ¼ watt, 5%	100KQ	*	$0.05
1	Resistor, R-2 10K ohm, ¼ watt, 5%	10KQ	*	$0.05
1	Resistor, R-3, 4.7K ohm ¼ watt, 5%	4.7KQ	*	$0.05
1	Resistor, R-4, 100 ohm, ¼ watt, 5%	100Q	*	$0.05
1	Light Emitting Diode D-2, Red	P-300	*	$0.22

A complete kit is available from F&M Electronics* at the address listed at the end of the article. Price is $7.95, plus $1.50 shipping and handling.

* = Any electronic supply outlet, or DIGI-KEY Corp., Hwy 32 S., P.O. Box 677, Thief River Falls, MN 56701. Part numbers given are DIGI-KEY numbers, add $2.00 for shipping and handling.

** = F&M Electronics (see address at end of article). Include $1.00 shipping and handling.

*** = R/C hobby outlets.

FIGURE 2

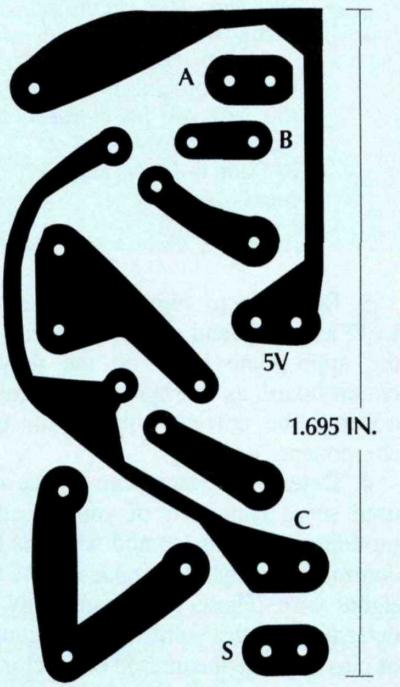
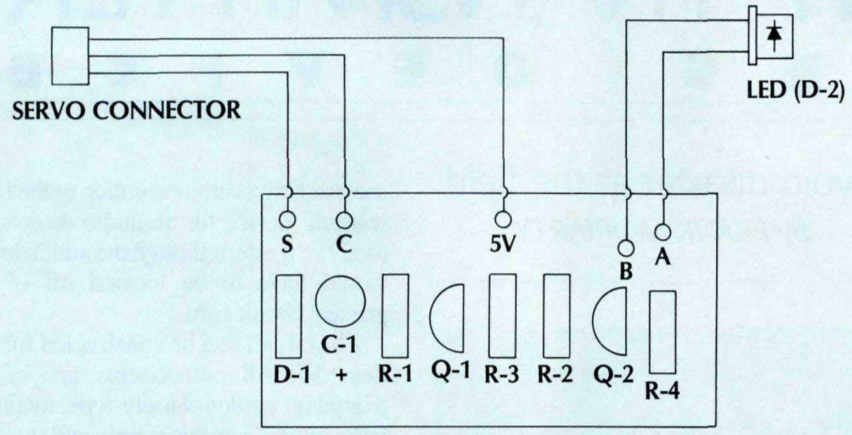
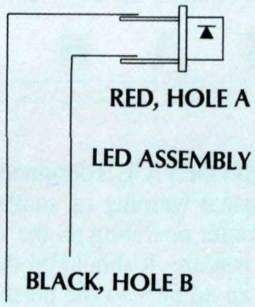


FIGURE 3



S—Signal from receiver module
C—Common
5V—Plus 5 volts
B—Cathode side of D-2
A—Anode side of D-2

FIGURE 4



Use No. 28 insulated wire for flexibility. Length—A/R. Put shrink tubing over the soldered leads to prevent shorting.

FIGURE 5

CIRCUIT DESCRIPTION

The signal is rectified by D-1 and filtered by C-1. When a signal is present (transmitter On), Q-1 will conduct and Q-2 will cease conducting, which causes the LED (D-2) to extinguish. When a transmitter signal is not present, Q-1 will cease conducting, causing Q-2 to conduct, which turns the LED On. The circuit is setup in the fail-safe mode; that is, with no transmitter signal present the LED will be illuminated. Resistors R-1, R-2, R-3, and R-4 serve as current limiters.

FIGURE 6

TROUBLESHOOTING

Begin by giving the printed circuit board a careful visual examination to be sure all of the components are in their correct positions and that they are of the correct value.

Examine all solder joints.

Check the wiring to the servo connector.

Check the voltage entering the printed circuit board. It should be 5 volts.

Be sure the LED (D-2) is installed with the correct polarity.

The following voltages were taken with a battery pack measuring 5.1 volts. They are typical of a normally operating unit. Each voltage is measured from the point listed to common. These voltage readings will vary slightly, depending on the charge on your receiver batteries.

POINT	VDC TRANSMITTER ON	VDC TRANSMITTER OFF
Junction of D-1/C-1	+3.5	0*
Collector of Q-1	.065	+3.7
Junction of D-2/R-4	+5.1	+2.3

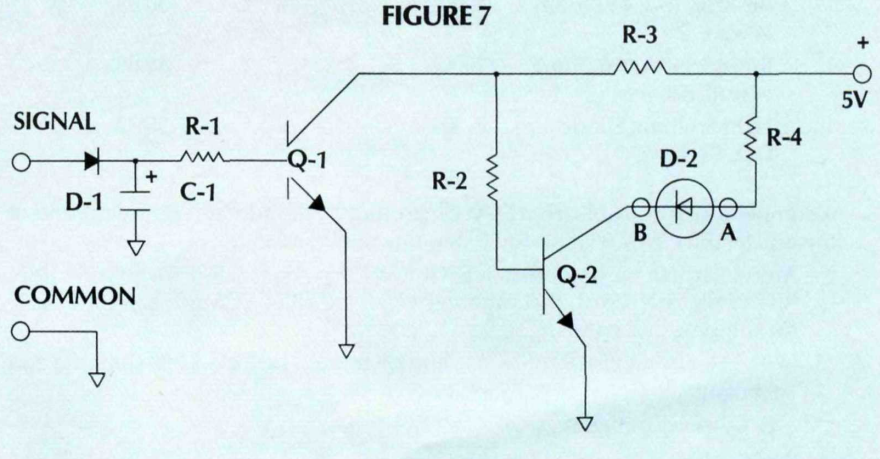
* = C-1 discharged.

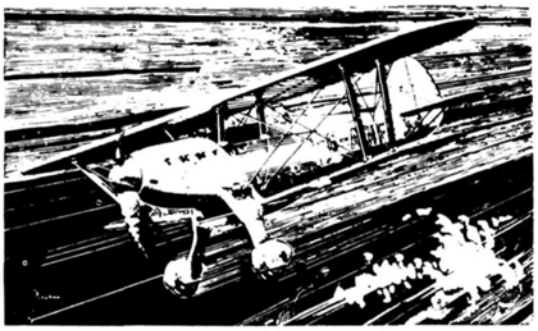
3. Referring to Figure 4, make the LED assembly and solder its wires into the appropriate holes on the printed circuit board, as in Figure 3. Be sure to observe the correct polarity for this component.

4. Determine which wire on the unused servo connector of your receiver module is the plus (+) and which is the common (-). The remaining wire is the signal wire. These wires can easily be determined with a voltmeter and a couple of pins to probe the unused connector on your receiver module. A technician friend might be able to help you here. Use the

(Continued on page 98)

FIGURE 7





Golden Age of

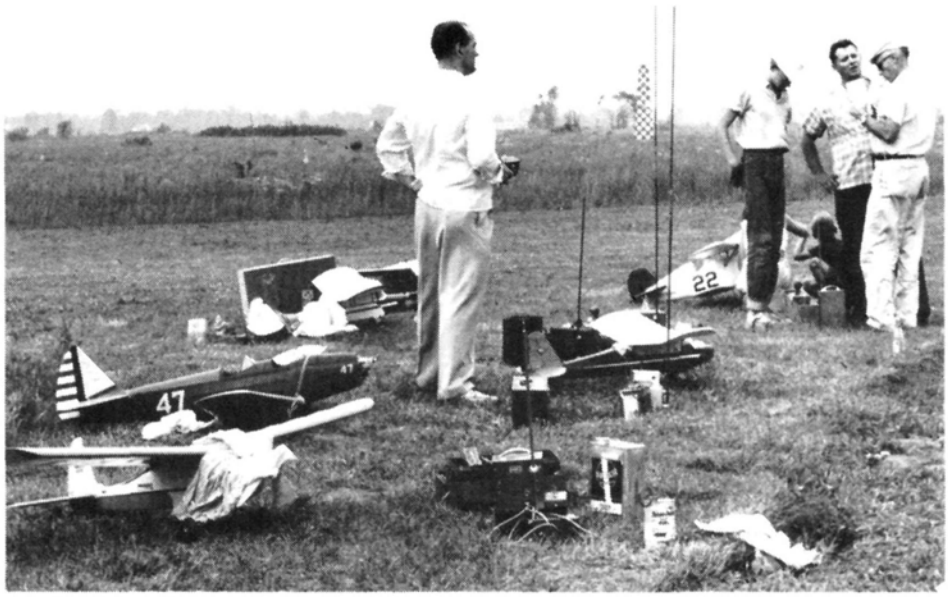
by HAL "PAPPY" deBOLT

EVERYTHING has its beginnings. Most innovations are born in one man's mind and are then further developed by others. In a small industry, as R/C was for many years, the early manufacturers were practically one-man operations. Names like Lorenz, Worth, Hoover, Dunham, Port and McCabb, plus many others, operated in the beginning days in sparse environments. Some grew, and a few companies like Orbit (Bob Dunham) and Kraft (Phil Kraft) eventually built significant facilities as R/C began to evolve. Of the "reed people" (sounds a little like an anthropological study, I know), others like Rockwood, Schmidt and Branstner came and went, but they did leave their mark.

In the November '86 *Model Airplane News* we covered Frank Schmidt's background. Remember, he was a long-time modeler whose interest in R/C went all the way back to the inception of radio control itself. In the early '50s, as a businessman/electronics manufacturer, he probably can be credited with *producing* the first resonant reed system. He delivered 100 or more systems before his health gave out.

The search for a reliable multichannel system led Frank to a production version of his five-channel reed system. Busy with production details, he also needed flight test evaluations. I was available and more than willing, as you can imagine. Even though that was over 30 years ago, the exhileration present while making that first reed installation is still clear. You just knew you were on the doorstep looking to the future of R/C!

The Schmidt design was based on Rockwood's concept, as were many other designs, but included significant variations. The Schmidt transmitter was ground-based and used a hefty battery. The antenna for 27 MHz was a 9-foot sectioned whip, the first step toward today's antennas. Control was by a hand-held, cable-connected, "stick box." Like today's Mod II, steering was a side-to-side stick movement; elevator was up and down. The mechanics locked out any possible simultaneous movement. A push button on the box side provided the fifth channel for engine control.



Typical flying fields in the early days of R/C saw a wide assortment of aircraft and radio equipment. Note size and arrangement of transmitters.

Frank's major concern was the receiver and the need for increased range. One countryside demonstration showed how well this was accomplished. With the transmitter on the ground, a fuselage containing the receiver was taken to the far side of a hill *three miles away.* The proof was reliable operation at that distance! The receiver used three tubes and added a isolation transformer to help reject noise. Noise interference is a problem we still have to contend with so many years later!

Attention was also given to the needs of the reed bank. He wanted ample power to drive the reeds under any conditions. Frank put considerable effort into the reed bank design. As a result, his arrangement would serve as a model for all future developments.

The individual reed vibration frequency was established by fastening all five reed blades onto a common holder and cut at an angle on the other end. Peculiar to the Schmidt bank, the blades were further fine-tuned by nipping corners of the blades off. The result was a very precise frequency response, even if the system's appearance seemed crude!

The reed bank contacts were small brass screws in brass arms that extended from the base to near the blade ends.

Tuning a transmitter control box to a reed bank was a clever operation that had to be performed before each flying session. First you backed off all the reed contact screws. With the first pot (channel), you rotated the pot while watching the reed respond. When the reed vibrated, you adjusted the pot for maximum reed deflection, then you *backed off slightly* toward the low-frequency side, because if there would be any drift it would be toward high frequency. With the pot adjustment completed the reed contact screw was lowered until the vibrating reed made positive contact. You then proceeded to the next channel.

You learned to do the reed adjusting *by ear.* Once understood, the singing sound was an easy way to determine and set a

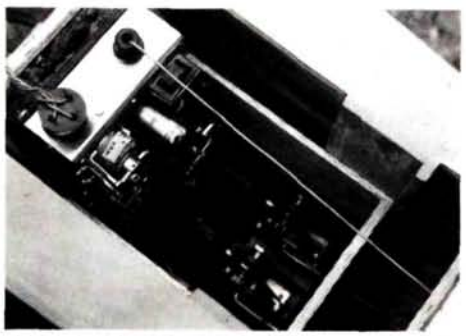
Noise interference was a problem—one we still have to contend with today!

very precise reed tune. Further, even the rankest beginner had to learn the procedure and use it before each flying session.

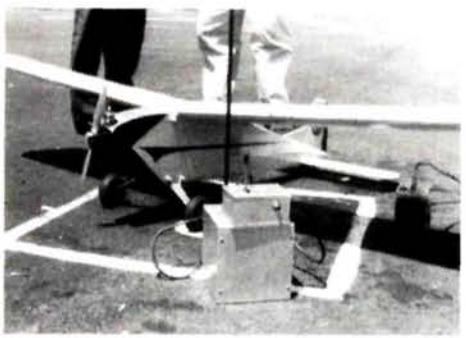
Naturally, Schmidt also developed his own servos. The initial concept used a very simple gear train that provided a linear output. A linear action was thought to be superior because the amount of control movement remained constant through the output range.

The servo's motor drove a spur gear that rotated a jack screw. A threaded "carrier" rode on the jack screw threads serving as an output. The advantage of the jack screw concept was the great speed reduction and power gained with only one step down. This servo was as simple as could be, and yet was an ingenious design.

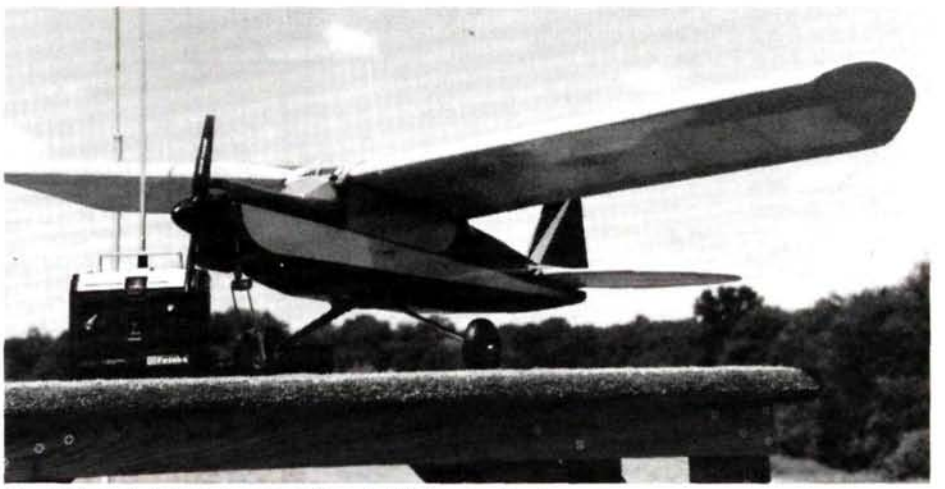
Another short-lived feature of the Schmidt servo was an elevator servo with *no neutral.* You could move it either way, from any position, and it would stay where it stopped. You were supposed to launch with the elevator in neutral, and then using the control box stick, "beep in" whatever trim was needed for the desired flight path.



The Schmidt receiver was installed in a removable box. Easily seen is the isolation transformer and several relays.



Schmidt five-channel reed transmitter and stick-type control box. Model is a modified "Over and Under."



David Ketler's Cub Squire. First flown in 1956 and still going strong.

As you can imagine, this was a scary concept! Today you have to wonder at how we could've flown safely with it, but we did, and even managed some loops. The concept was soon thereafter changed to "self-centering," basically a self-neutralizing servo—as with the directional control servo—with a "wide neutral." This became the popular elevator-servo arrangement. It returned to neutral from full deflection, but with the wide neutral adjustment you could "beep it" off neutral for the desired trim.

Frank had evaluated the servos extensively with flight tests using the Berkely Cessna as a test bed. My initial flying was also done with the docile, Live Wire Cruiser when the transition to reeds was still new territory.

You might like to compare the cost of these reed systems with what you have today. The Schmidt system sold for $495 *less* batteries and most modelers were happy to pay it. In today's dollars that would be close to $2,500!

When the Schmidt system went into production, an imaginative modeler in Detroit got ideas of his own. Dick Branstner had found some basic research indicating that an even better reed system could be developed. We were fortunate to be a part of his early efforts—and we'll have that story for you next time.

Many of you OTers have offered interesting stories that I'm sure many others can relate to their own experiences. One in particular, a fine letter from Davis Ketler of Grove City, Pennsylvania, tells of a successful R/C model in the mid-50s—a Live Wire Super Cub, the Champion's stable mate. He had considerable success with a Babcock tone radio, compound escapement and a two-speed .15 engine. As happened so often, one day there was no control and the Cub raced away into horizon. Several days of searching proved futile, but a year later a friend spotted the lost model while flying full-scale; he returned it to David.

From red silk the covering had bleached snow white and it was apparent that field mice had used the fuselage for a home! The Cub was recovered with nylon and flown for a couple more years

(Continued on page 99)

Coverite's

BLACK BARON SPECIAL

Trainers don't have to be boring!

y MIKE LEE

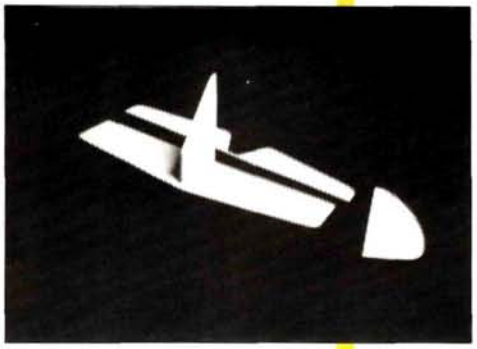
IN THE DAYS and years after WW I, aviation lured all sorts of people. It seemed like everyone went out to the local flying field to watch the flying machines. Soon, air racing began and the tough little pylon ships like the Gee-Bees, Ikes, and Cauldrons took the love affair further. It was a great time for aviation, a time never lost to progress.

Even today, pilots love this era of aviation history. If you're one of these folks, then Coverite* has a trainer that puts you in the cockpit of a snazzy 1930s plane without requiring the painstaking time and skill of a scale craftsman. Introducing the Coverite Black Baron Special, touted as the first Super Trainer ever. It combines the stability of a basic trainer with the snazzy looks of a classic-era ship.

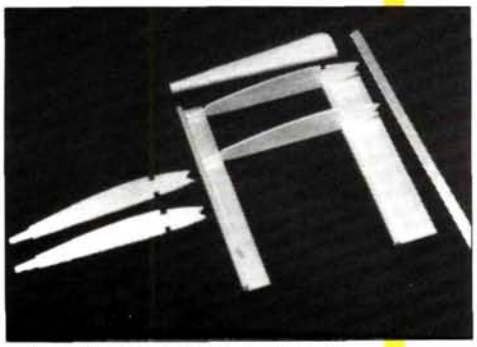
The Black Baron Special is for novice pilots who are just getting into the sport and for the sport pilot who wants more than just an ugly box with wings attached to it. It features easy construction techniques with formed plastic shells to produce an aircraft that looks nothing like a trainer. Let's take a first-hand look at what the Baron is made of.

CONSTRUCTION. The Black Baron Special is con-

The kit is high-quality and includes illustrated manual.



Tailfeathers are basic.



Wing ribs are assembled on lower wing sheeting and spar.

With leading edge and top spar installed, addition of top sheeting remains.

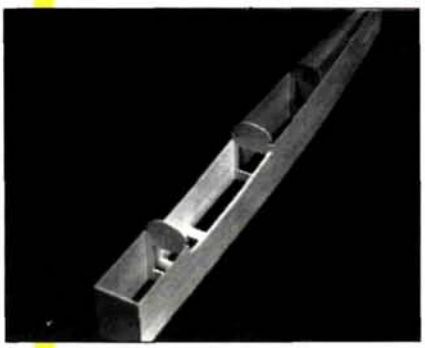
more than adequate for this job.

Once the doublers are in place, the builder/pilot gets to make his first decision on the kit. The Black Baron can accommodate both two- and four-stroke engines. The plans show both, and the main difference is in the placement of the firewall. We chose the two-stroke version.

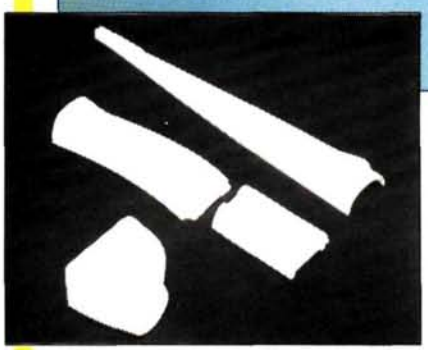
Press onward from here with installation of the plywood formers and joining at the tail. Upper stringers are placed along the rear upper turtle deck to support the plastic turtle deck.

At this point, the fuselage looks like almost nothing, until one adds the formed plastic shells. This consists of the rear turtle deck, forward cover,

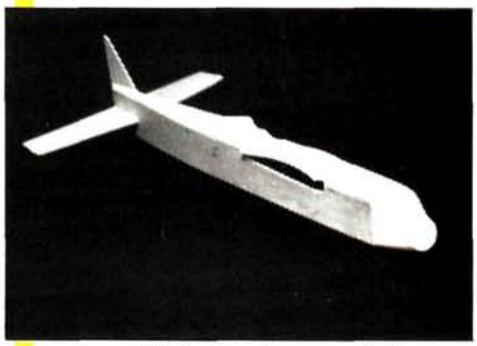
Completed wing panel shows dihedral brace.



Fuselage main frame assembly is straightforward.



Formed parts include fuselage top and cowl.



Assembled fuselage is now ready for gear, engine, and covering.

structed of balsa, ply, and some plastic. There's nothing unconventional about the materials used and will present no problem to first-time builders. The fuselage is the basic box style, and construction begins here.

The fuselage sides are one-piece units doubled-up with balsa doublers. For all phases of construction, we used Hot Stuff T adhesives by Satellite City*. These adhesives are

cockpit deck, and cowling. The rear turtle deck and forward cover is all we deal with right now, and they fit well. Hot Stuff Super T held them in place nicely. Finish the fuselage with bottom sheeting, tank floor and wing hold-downs.

The wing is a modified D tube with a semi-symmetrical airfoil. Assembly begins with placement of the bottom spar and trailing edge stock. All the ribs are placed on the spar and then are glued in place. The upper spar, upper trailing edge, forward sheeting and leading edge stock round things out. The wings take no time—before you know it, they're ready for joining.

At the wing center section, one needs to pay attention. The wings are given spanwise strength through a single plywood dihedral brace. This must be an exact fit with no slop allowed and a tight fit between the wing halves. This is the only critical joint in the whole plane, so don't blow it here! After the wings are joined, final center section sheeting is added, wing tips are placed, and final sanding is done. The wing does feature ailerons for roll control, but as we'll see later on, they're not really necessary.

At the tail are the horizontal stabilizer and vertical stab, both sheet balsa units. The three or so pieces that make up these parts are assembled, sanded to shape, and then placed on the fuselage. Make sure they're aligned correctly.

Now for the second decision for the builder/pilot. The Black Baron Special can be made as either a conventional geared ship, (tail dragger), or as a tricycle-geared ship with steerable nose wheel. We opted for the tail dragger version as it just looks better on the Baron. All hardware and gear struts for both versions is supplied in the kit.

The final stages of the assembly are fitting of the cowling, wing, and then final sanding. On the wing-fitting, the builder is directed to go all the way to actually bolting the wing in place and then

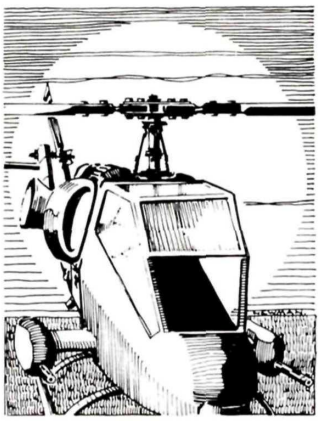
(Continued on page 102)

You would think a dummy like me would follow the directions and not second-guess them!

Although the Black Baron Special has rakish lines, it's really quite docile.

Gear configuration enables realistic ground handling.

Positive angle of attack makes for nice takeoffs and gentle landings.



Helicopter Challe

by CRAIG HATH

IF YOU'RE A newcomer to the sport of R/C helicopters and you're considering kit construction, you're probably overwhelmed by the apparent complexity of the helicopter kit. The most common fear I've encountered in people just starting out in R/C helicopters is the threat of having to assemble the model themselves. One glance into these kits sends a shiver down a would-be helicopter pilot's spine.

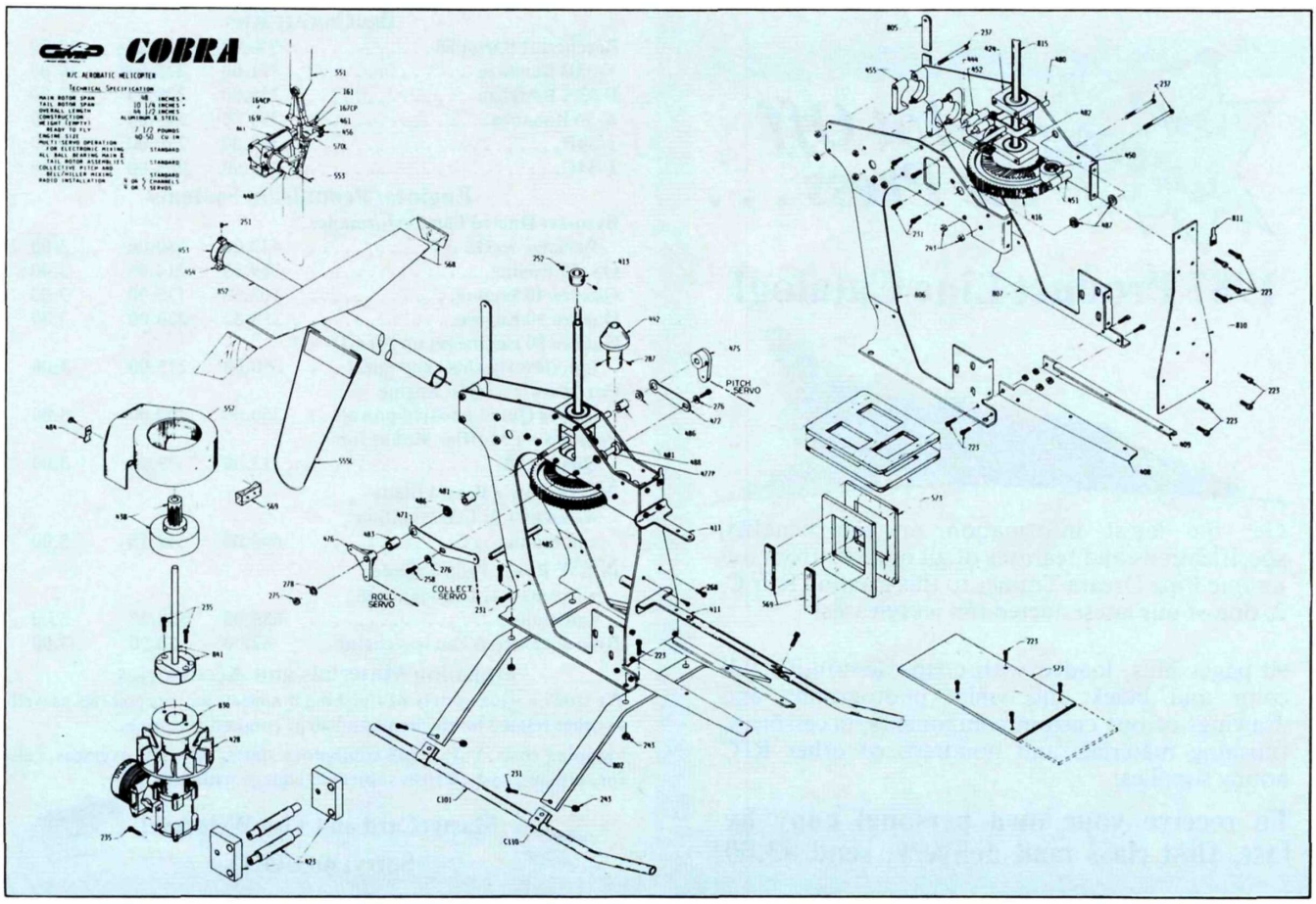
This month I'll try to dispel some of the misconceptions about building an R/C helicopter. In previous articles I've outlined items that will be useful for learning and building the model. If you've been following along, you'll have made a choice of kit and purchased all of the accessories that will complete the project. You'll also have made yourself a list of the tools that you'll need and will have them handy. Well, let's get started.

Preparation

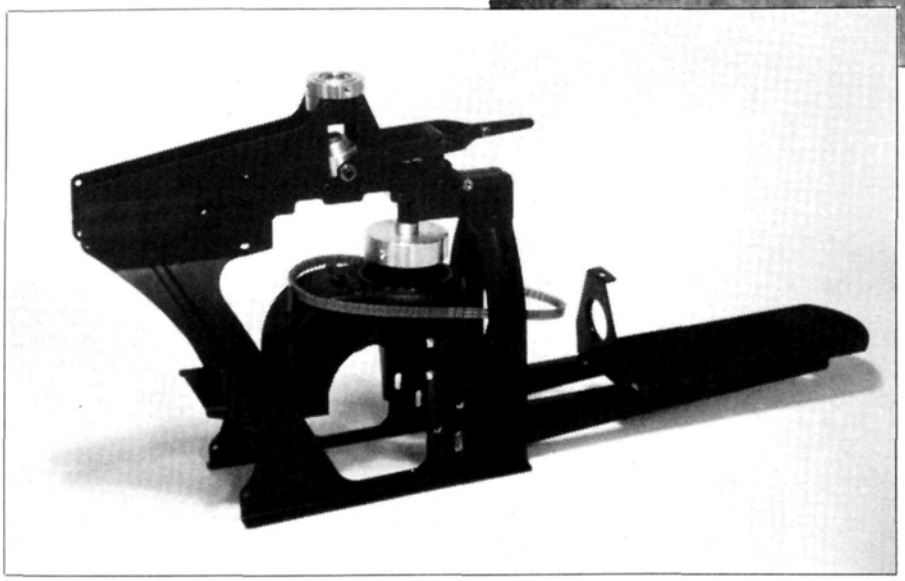
Getting yourself organized and into an area where you can leave your uncompleted model undisturbed will speed assembly greatly. If this is impossible, perhaps you could find a board that can be placed on your temporary work area, and then be picked up and stored with your work intact. You might want to consider a piece of plywood cut to around 2x3 feet, as this size will be adequate for the helicopter and will also fit in most closets. You should have a box for your tools by now. If you don't you could get one of the inexpensive fishing tackle boxes available in most department stores. These boxes can also go with you to the field. I keep all of my special tools in one of these boxes, along with spare parts and miscellaneous odds and ends.

Nuts and Bolts

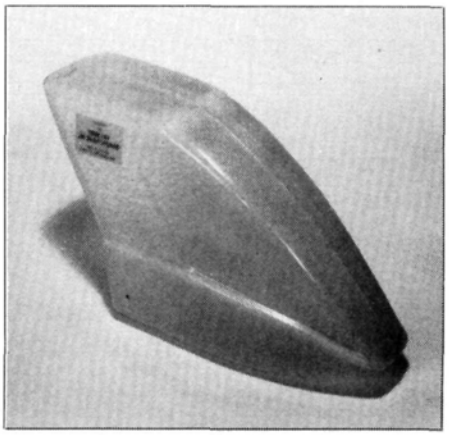
Every kit will include nuts, bolts, and



Below: Basic framework of the Baron 60 showing minimal parts and excellent design and engineering concepts. Right: Author's Kalt Custom Baron 50 is an example of the level to which helicopter technology has evolved.



fasteners. Different brands of kits handle packaging in different ways. Some are packaged in bags numbered to correspond with steps in the assembly manual, and some are packaged in groups: one bag might be all Allen-head bolts, another nuts, etc., and some have all of the fasteners in one bag. At any rate, it might be helpful to sort out all of the fasteners ahead of time so that every time you need, say, a 3 mm x 15 mm Allen bolt, you won't have to fumble around for your metric ruler or look through the manual for the description. Get yourself an egg carton that is molded of foam and has no holes between the cups. The ones that hold a dozen and a half eggs will give you separate cells for all of the various sizes of nuts and bolts. As you sort the fasteners into each cell, mark the cell with a felt-tip pen as for size and description. This will save you time later and the egg carton can be closed up for storage between building sessions.



One of the new fiberglass canopies from Yale Manufacturing, from the GMP Cobra.

Plans and Instructions

All kits will include instructions, usually with drawings, and some will provide exploded views of the mechanics. These items will be your guide, and should not be taken for granted. If you're mechanically inclined and have a base of experience with drawings, the exploded views will probably be familiar sights. If this is all brand new, relax, you're the real reason these drawings exist. Take the time to read the instruction manual while actually holding the parts in reference. Visualize how the parts relate to each other. You'll soon realize that the end result is not so complex.

The Construction Process

Now that you're organized and have read the instruction manual well enough to recognize the difference between the main frame and subframes, it's time to start construction. The construction sequences in the manuals are almost always the best maps for assembling the model, with one exception. Any time a part must be painted, such as most of the wooden servo trays and the tail fins and plastic bodies common with most kits, you'll come to that step and discover that you can't go any further until the part is finished and the paint dries. If the kit manufacturers would consider this, they would change the sequences to allow you to get this part out of the way first. Any

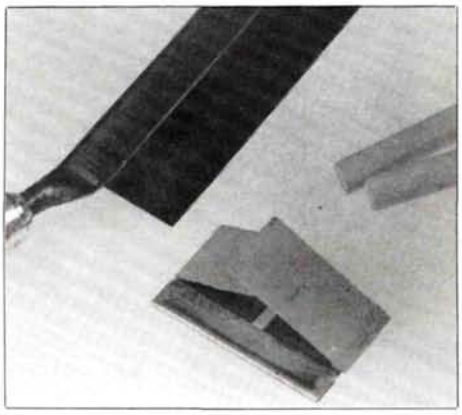
(Continued on page 118)

How To:

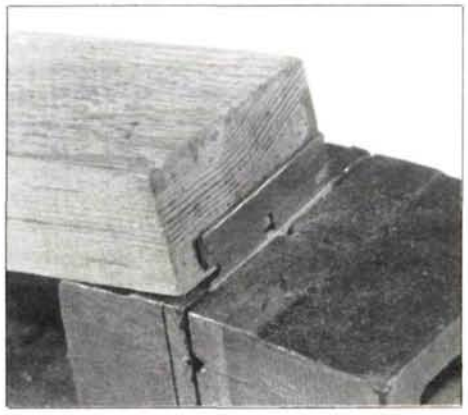
by RANDY RANDOLPH

MAKE A DISPOSABLE RAZOR KNIFE

We seem to live in a disposable world, everything from plates to flashlights, so why not a disposable razor knife? Actually the idea is not as bad as it sounds for these can be carried in the flight box or used at the bench and, when dull, discarded. For that matter, they can be configured to fit specific needs or hand sizes. The photos show the way.

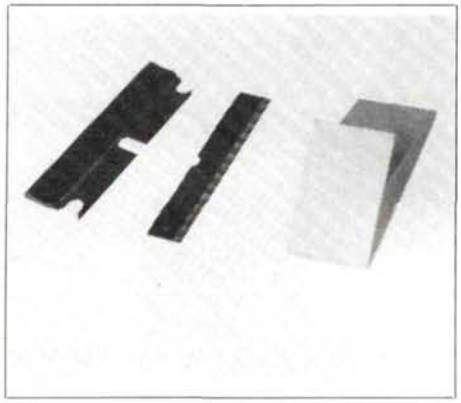


1.



2.

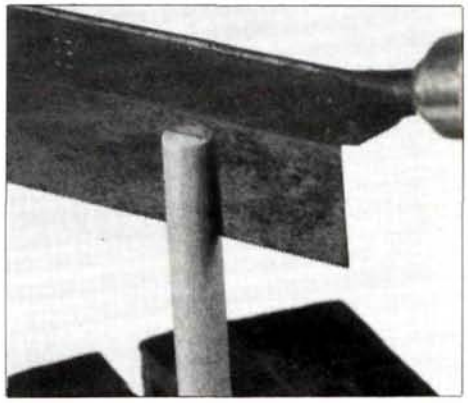
1. The necessary tools and supplies include a razor saw, a single-edge razor blade, and some hardwood dowels. The dowels should be no smaller than ⅜ inch diameter and 6 inches long.



3.

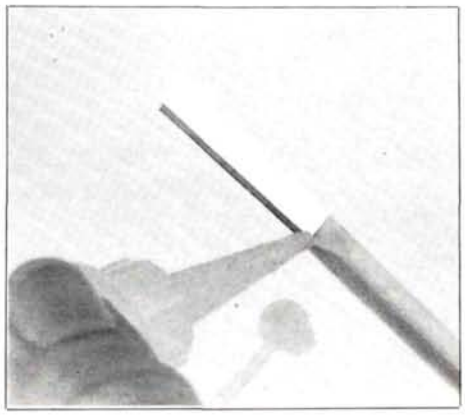
2. Chuck the razor blade in a vise or a pair of pliers and break the blade just below the side notches. The method shown uses a block of wood to shear the blade evenly.

3. The shearing process produces a very sharp blade about ⅜ inch wide. Slip the rib part of the blade back into the protective cover for disposal.



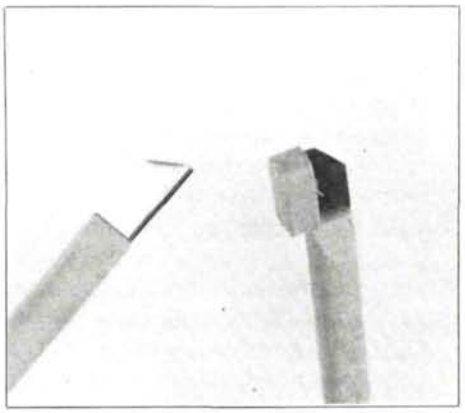
4.

4. Saw a ½-inch slot in the end of the dowel with the razor saw. Taper the sides of the dowel up to the slot on both sides so the finished product will be easier on the fingers.



5.

5. Insert the blade into the slot and cement it in place with one of the thin instant glues. This knife was made for carving so the full length of the blade was used.



6.

6. Each blade can be broken in half and will make two knives. Break the tips at an angle away from the sharp edge to resemble a No. 11 blade. Cover the blade with a piece of balsa if it is to be carried in the flight box.

Unprecedented engineering in this West German design.

Robbe AVANT-GARDE

from Miniature Aircraft

Type: *Sport Competition*
Weight: *8½ pounds*
Rotor Span: *54 inches*
Engine: *Standard .60 aircraft*
Channels: *5 (helio radio)*

by PAUL TRADELIUS

THE ROBBE Avant-Garde (imported by Miniature Aircraft*) employs such new and outstanding techniques in R/C helicopter technology that it truly lives up to its name. This pod and boom copter, without the typical pod and boom look, is designed around the latest carbon-fiber-filled technology and is an excellent forerunner for the scale aerobatic enthusiast.

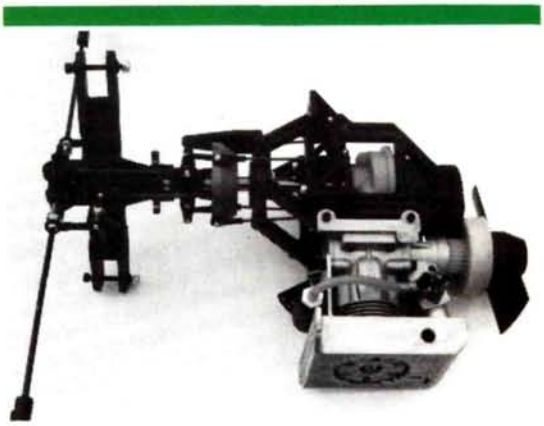
Whether you're just learning how to hover or interested in unlimited aerobatics, the Avant-Garde can give you the best of both worlds because it uses the famous Heim mechanics that

Avant-Garde is smooth and stable.

have been winning contests throughout the world for more than five years in the Heim Star Ranger. And speaking of the Graupner* Star Ranger, the Avant-Garde also gives you the opportunity to transition to a beautiful scale fuselage when you're ready. Miniature Aircraft offers complete fuselage kits of the Star Ranger, Bell 222, Robbe Ecureuil and BO-105, which are designed to accept Heim mechanics. Because all these helicopters use the same bolt-in mechanics, they can be removed from the Avant-Garde and installed in the fuselage of your choice in less than an hour.

THE KIT. Everything arrived in an attractive, colorful box that more than adequately protected all the components. Right on top of the kit was the instruction manual, written in five languages, and one of the best I've seen. Each stage of assembly has a corresponding bag of parts, so only those parts needed for a phase of construction are opened at a time. I recommend that you use a muffin tin, or something similar, to separate and hold the smaller parts once a bag is opened.

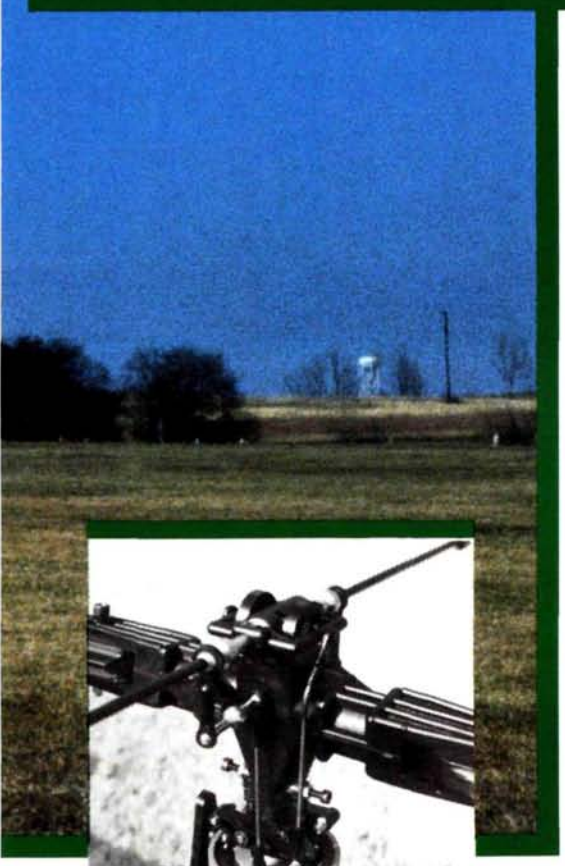
Two very large exploded diagrams show every nut and bolt of the helicopter. Each stage of the instructions also reference a section of the exploded diagram so you know exactly where to look while working on each subassembly. Supplemental instructions are also supplied by Miniature Aircraft to keep you up to date on the latest parts improvements and additional building techniques.



The light yet nearly indestructable Heim mechanics with engine and large heat sink. Note the cooling fan.

CONSTRUCTION. Begin with assembly of the main rotor and engine mount. This one complete unit, made largely of carbon-fiber-filled components, is placed into the airframe and held in position with four nuts and bolts. This makes it very easy to disassemble or change the mechanics to another helicopter; just take off the four nuts, muffler and fuel tubing, and the entire unit lifts out of the airframe. Initial setup of the head is a snap because all the pushrod lengths from the swashplate to the head are given on the plans.

(Continued on page 105)



The aileron servo is mounted to the mixer and is rotated back and forth as directed by the collective servo to change the pitch of the main rotor blades.

by MIKE LEE

Type: *Pattern*
Span: *67¾ inches*
Area: *820 square inches*
Weight: *7 pounds*
Channels: *5 to 6*
Engine: *.60*

THERE'S NO doubting the success of Austrian pattern pilot Hanno Prettner, who has virtually dominated international pattern competition for the past decade. His winning designs began with an aircraft called the Super Sicrolli and progressed through the Curare, Magic, Dalotel, Calypso, and now his Supra-Fly.

Supra-Fly made its debut as the world champion design in 1985. While this feat was some two years ago, the design is still timely and competitive. It has roots in the previous Calypso design in that the ship was meant to be very

A wo

The rakish lines of the Supra-Fly belie the incredible performance that this aircraft is capable of.

EZ Supra-Fly

Hobby Shack

simple with the use of only five channels of control. For awhile it was an arms race to see who could place more gadgets on the ship to make it work. Air brakes, flaps, variable pitch props, in-flight mixture control, and more. Hanno reasoned that this type of arms race would only keep newcomers out of the pattern game instead of attract them. Calypso and Supra-Fly put things back into perspective.

With the help of Hobby Shack* and EZ, the Supra-Fly becomes a two-time legend. For the first time, a world-class pattern bird has been brought to the public as an already built, painted, and darn near completed kit in the famous EZ format. This isn't your standard ARF bird that merely reflects copy-cat looks. The EZ Supra-Fly is a highly engineered, contest-ready bird that puts together features not found in any previous EZ kits.

THE KIT. The basic airframe consists of a balsa frame plywood-reinforced and covered with pre-painted vinyl-over-foam skin. Several plastic covers and trim sheets are also included, but here is where the commonality with other EZ kits ends.

The Supra-Fly is the first EZ kit to utilize a carbon-fiber-reinforced main spar for the wing and tail sections. As with the rest of the kit parts, the spars are virtually ready to place into the wing and stab halves with epoxy.

ASSEMBLY. The motor mount consists of four bolts epoxied into the nose of the ship and protruding some three inches forward of the firewall. The motor is then mounted to a large steel plate with pre-drilled holes. You remove the rear backplate screws of the motor and then mount the engine to the steel plate using the kit-supplied backplate screws, which are longer. Never mind that you have an engine different from what we used; believe me, 99% of the current motors use the same size screws. You may also disregard the fact that your engine may not match the holes in the motor

Hanno Prettner—R/C Champ

by CHRIS CHIANELLI

HANNO Prettner, born in 1951, started modeling in 1957 with free flight models. Today, the name Hanno is synonomous with precision aerobatics; he's the pattern flier's flier. With a list of over 250 international and national competition victories to his credit, and with a name that R/C manufacturers all over the world dream of having their products associated with, Hanno Prettner maintains a reputation of a friendly gentleman and well-mannered sportsman. Maybe it's easy to be a nice guy when you're at the top.

Not only known for his flying ability, Hanno showed exceptional talent as a designer when he won (with less than a year's practice) the Carthinian state championship with an ST .60-powered Wendelin that he himself designed. In 1970 he took fourth place in the world championship in Doylestown, USA with his Sicroly. Until 1973, he competed in glider, powered glider and aerobatic glider contests and championships, several times winning first place in *all* categories. Hanno showed up at the 1973 world championships at Gorizia, Italy, crushing the competition with his new Supra-Sicroly II, which featured a new airbrake system that he later used to snatch the Tournament of Champions in '74.

During the 1975 world champs in Switzerland, Hanno showed up with what may be the most flown aerobatic model in the world, the Curare, on which he was the first to use a tuned pipe. It was also on the Curare that snap flaps were used with great success to achieve square maneuvers, snap rolls and rolling circles required for the Las Vegas TOC. During the following years, most top pilots used this system developed by Prettner. Always keeping one step ahead, Hanno again won with his newly developed rotating airbrakes on the Curare and took the fourth TOC.

The list of innovations by Prettner goes on and on—the Dalotel, a major breakthrough for constant-speed ¼-scale; the Magic, with its integrated tuned pipe and variable-pitch prop used to give a constant speed down-leg; the pioneering of twin ST .75s and ST .90s in his own-design gear-drives; and the Calypso, a model he designed because he felt things were getting too complex and expensive for the average modeler. Knowing how important it was to keep the interest of the beginning and intermediate pilots if the pattern scene was to survive, he developed and won first pilot three times in the world championship in Pensacola with the simple Calypso.

With all this experience, this seven-time-consecutive TOC winner has brought us what he believes is "my best flying design and very easy to handle": the Supra-Fly.

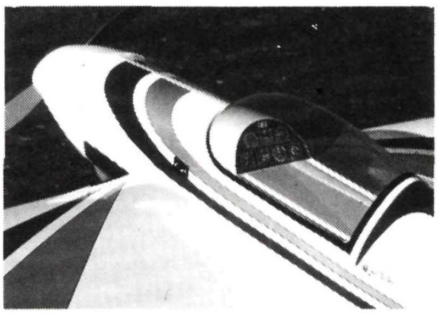
In the 1985, Netherlands-held world championship, Hanno Prettner and his JR-guided, Super Tigre-powered Supra-Fly racked up an astounding 4,998 points of a possible 5,000. Case closed. ■

SUPRA-FLY

mount plate. It will still fit! So far, HB, O.S. Max, Rossi, OPS, and Picco engines have been mounted with no sweat. Neat, huh?

The Supra-Fly goes together with relative ease. The wings take nothing to join with the kit-supplied epoxy and carbon-fiber spar. The ailerons are

Author Lee radiates his excitement over an airplane that performs so well with so little effort.



Quality of the Hobby Shack kit is flawless.

controlled with separate wing-mounted servos. Access holes are found in the wing ribs to allow you to pass the servo wires through. Capping this off are plastic covers held in place with wood screws.

The kit also features OK Models' mechanical retracts that are found on several other EZ kits. They work well and are smooth and easy to set up. You'll find soft foam tires resting on the ends of the retracts to provide excellent landing dampening and light weight. The retract servo sits on the wing center section and is mounted with kit-supplied servo mounting lugs.

The fuselage innards provide plenty of room for radio gear. Servo trays are provided for you, as well as the pushrods and aforementioned rudder cables. Even the throttle cable is supplied.

At the tail, the stab halves are joined onto the spar, which is mounted through the fuselage first. A tight fit, sometimes, but it will fit, and epoxy takes care of the rest. The vertical stab

(Continued on page 115)

O.S. FF-240

(Continued from page 48)

four-stroke) sounds as though it is running faster, not slower, than its actual operating rpm. Overall noise levels, however, were still reasonable with the standard short exhaust pipes. (The maximum sound level readings at one meter were between 94dBA and 96dBA on the 20x8 Top-Flite prop.)

The higher exhaust frequency also means that one does not realize just how slowly the Pegasus is idling, when the throttle is closed, until this is checked with a tachometer. Again on the 20x8 prop, the test engine idled with complete reliability at a mere 1,000 rpm. It would pick up again immediately when the throttle was reopened and there was never a single instance of its misfiring or "losing" a cylinder during these checks. The instruction manual suggests that, as a safety measure under certain conditions, owners may care to use a glowplug reheat system, i.e., an on-board Ni-Cd battery which will re-energize the plugs automatically when the engine is throttled down to below 2,000 rpm. But our tests seemed to indicate that this should not be necessary. A check on the safe idling speed with the plugs energized, yielded a minimum safe idle of around 850 rpm, whereas it seems unlikely that one would need to throttle down to much less than 1,500 rpm under normal operational conditions.

As noted at the beginning of this article, the Pegasus was pleasingly free from any tendency to detonate. Even when loaded down to a full-throttle 5,000 rpm on a 22x10 Airflow prop (a needlessly large size which should not be used in practice) the Pegasus still pulled steadily with no detectable detonation. Similarly, when the engine was running on normal prop sizes, deliberate attempts to provoke detonation, by over-leaning the mixture, merely resulted in the engine slowing down. It would pick up again if the needle was reopened or would cut out cleanly if leaned out still further, but still showed no inclination to detonate.

Typical prop rpm figures recorded on test, using a 10% nitromethane fuel mixture, included 5,900 rpm on a 22x6 Airflow beech, 5,850 rpm on a 20x10 Top Flite maple, 6,700 on a 20x8 Top Flite maple, 7,300 on a 20x10 Kavan glassfiber-epoxy, 7,400 on an 18x10 Zinger maple, 7,450 on an 18x10 Top Flite maple, 7,700 on a 20x6 Airflow beech, 7,900 on an 18x8 Top Flite maple and 8,450 rpm on an 18x8 Zinger maple.

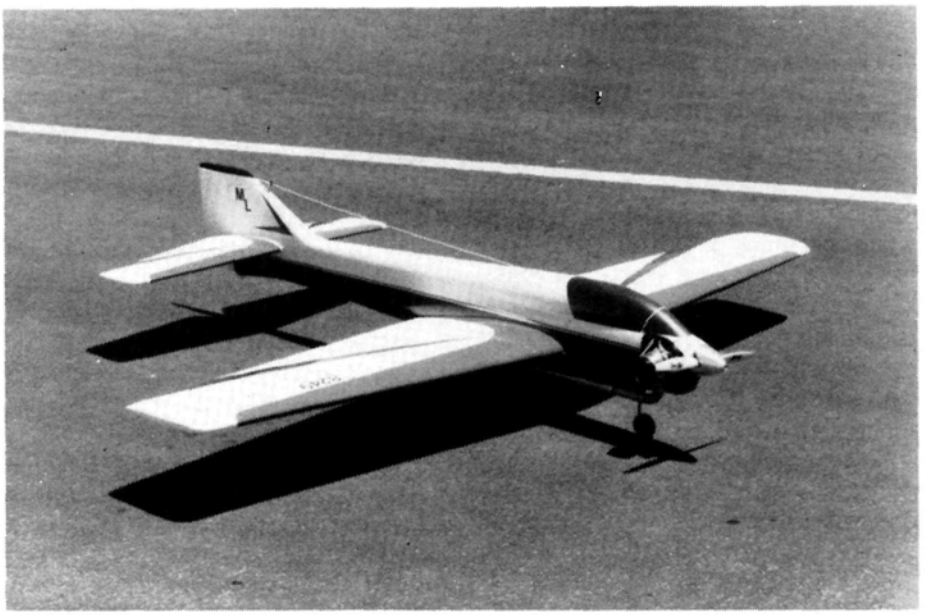
There is little point in using a prop that

(Continued on page 83)

Pattern Matters

by MIKE LEE

WE'RE NOW well into 1987 and coming your way this year is the Masters Tournament for pattern. This meet will determine which three American pilots will compete in the World Championships. I don't have a date or a location for this meet yet, but I'll bring you that info as I receive it. As you would have guessed, the FAI Turnaround schedule will be the pattern of the day. I'm struggling to make the Masters Tournament. How about you?



Author's favorite bird for the past two years is the Illusion, a direct descendant of the Curare.

Recipe for Newcomers

I'm going to jump back a bit this issue, back to the early editions of this column some three years ago. During that time, I spoke about my recommendations for a pattern bird for newcomers. Today, this is still the most asked question I receive, so, for the sake of newcomers or for those still searching for an entry-level bird, let me discuss my choices of pattern birds once again.

Two-times Nats Champ Pete Callas flies a Tiporare. As discussed in this month's column, this design and its relatives perform admirably in all pattern classes.

First, there is no single, best, all-of-everything pattern ship available today. Every design has certain little quirks or habits that some pilots may not like, yet each has something else outstanding that attracts the pilots who fly them. Add to this a fudge factor comprised of the individual weight, balance, and force setup that the builder places into the ship. But, the overall average results are the following designs which consistently serve their pilots well despite massive variances in the individual ships:

My personal choice is the Curare series of aircraft, which includes all variants of the design, such as the Tiporare, the Hipo Tipo, the Super Curare, and the Illusion. This design was originally conceived by Hanno Prettner in the early to mid 1970s. The Curare and its descendents all share common flight characteristics, such as a wide flight envelope, gentle stalls, easy construction, and the ability to be configured in several different versions without losing the basic good features. I've seen these ships with every type of engine, retract, pipe, radio, flight surface setup including pivoted wings, and flown in every pattern class, and still fly well enough to come out winners consistently.

For those who want a bit slower ship or maybe an easier handling ship, the designs by Joe Bridi starting with the Kaos and ending with the Dirty Birdy are excellent choices. There is no doubt that these planes are excellent for the first two pattern classes of Novice and Sportsman. They are a bit slower to fly than the Curare series, but they are gentle on stall, have a wide flight envelope, easily fly with or without a tuned pipe and retracts, and are tough enough to withstand the harsh treatment of flight realities.

Both my first and second choices have featured aircraft with wide flight envelopes and gentle stalls. You may have also noticed, if you stay current on airframe designs, that both choices have straight wings (tapered maybe, but not swept). Here are the reasons for this.

A ship with a wide flight envelope means that the ship will fly well at high speed or low speed. This is important to the newcomer because it is not likely that he's going to know how to stick a tuned pipe on the engine and get it right. More than likely, his engine will turn about 13,000 rpm at best, while most of the Experts and Masters will turn 14,500 plus. That means that the novice will need to derive the same flight characteristics as the Masters in order to win. A ship with a

wide flight envelope will provide this with little complaint.

According to the present rules, Novice class pilots are not allowed to have a tuned pipe anyway, so now we're talking about 12,500 rpm on his engine. He's also not allowed to use retracts (although the aircraft may wear them). The additional drag from the wheels will slow the ship even more, making the wide flight envelope even more important. The worst airframe to choose for this pilot is one with a swept wing with less than 720 square inches of area. This type of ship must fly fast to be effective and the odds are against the novice of having the required speed.

An aircraft with gentle stall characteristics will afford the up-and-coming pattern jockey a much needed fudge factor when it comes to landing the bird. Heaven knows how much his knees knock when a pilot faces his first few pattern meets. He doesn't need a bird that tip stalls or snap rolls when the airspeed is bled off. The gentle stall also allows maneuvers to be executed more easily. I have seen many planes begin to snap roll over at the top of a slow loop. A gentle stall will allow the plane to simply fall through without the pilot trying to right the wings after a snap.

The last choice is a ship with a swept wing or less than 720 square inches of wing. This is personal opinion, but one I think has merit. A swept-wing bird has certain flight habits which the novice doesn't need, one of which is a tendency to drop the wings in a turn.

The ships that I've recommended all have greater than 700 square inches of wing area. They are roomy enough to accommodate virtually any modern radio gear, and fly just great for everyone. The flight line of almost any pattern meet will prove it. Numerically speaking, the Curare derivatives outnumber all other designs, sometimes all put together. A Kaos or two will always show up somewhere, and these are backed up with at least a few examples of Dirty Birds. The success of these designs is hard to beat when the numbers prove it. If you're thinking about the first pattern bird design, consider these heavily.

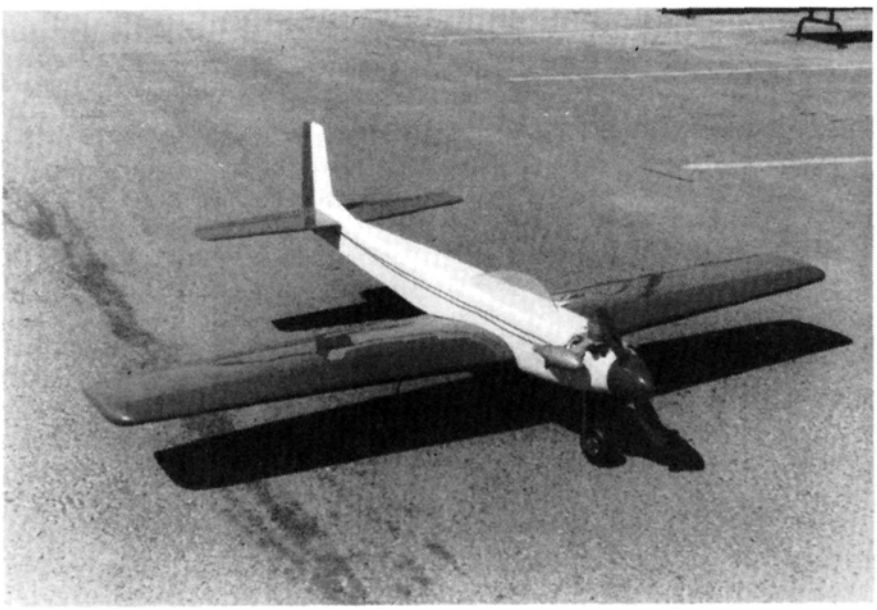
In the engine department, all I can say is pick an engine that's known to be reliable: O.S. Max, Rossi, Webra, Fox, OPS, Y.S., and Picco to name a few. My choice is the Rossi, but only if you're ready to dicker with it a little bit. For out-of-the-box reliability, the O.S. Max series engines are hard to beat. And for gut-wrenching horsepower, the Y.S. engine seems to be the choice, although I've yet to play with one. To confirm my recommendations, go to the flight line of a pattern meet and see what engines are being used, then make your own choice. Don't worry about the pipe for now, especially if you're in the Novice class.

For the landing gear chores, I like any brand of mechanical retracts. They're dependable once they're set up correctly, and will only fail if the radio flops or the wheel jams. For ease of installation, you can use pneumatic air-driven retracts. They go in fast and require no special servo to drive them. Just make sure that you maintain them. The third type, electric retracts, are so hard to find anymore that they don't make for much of an alternative. Whatever the choice, make sure you fully understand how they work, how they can fail, and how to maintain them. This will keep you from performing a "Twelve O'Clock High" belly flop on landing.

The Sig Kouger being held here by Craig Hath also is usable in pattern.

The radio is your choice, depending on what you desire for extras and options. I recommend a radio with dual-rate controls as a minimum. They are worth their weight in gold when you learn to use them.

There you have it, my recipe for the newcomer pattern pilot. This is only a basis to consider, not a hard, fast formula to use. It's developed through my own experiences at the flight line, and what shows up in the hands of other pilots in the winner's circle. If you're heading to find the pathway to the gold, take the easy route and use what gets you there the easiest.



The classic Kaos design by Joe Bridi is fifteen years old and still competitive.

New Products

For over a year and a half, I've been flying the Futaba* PCM 8-channel radio in my number one ship. I've reviewed it here, and there are several thousand in use today. But many pattern pilots, and even more sport pilots, have longed to get the reliability of the PCM and have been stopped by limited budgets. Futaba now brings PCM modulation a lot closer to the sportsters among us.

The new Conquest PCM ushers in a new era of radio reliability for all pilots who demand the most. Using the tried-and-true technology the 8-channel pattern PCM model, the Conquest shares the same PCM type of modulation. It also features dual rates on elevator and

(Continued on page 118)

Tech Tips

Basics of Scratch

by Dan Santick

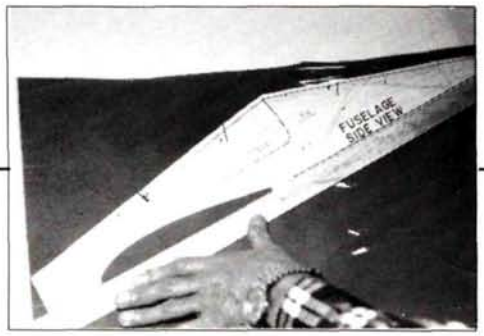
COVERING a scratch-built model is no different than covering any other kind of model, but since I started this series in the February 1987 issue, many of you have asked, "What's the best way to cover a model?"

The answer to that question has about as many answers as there are modelers. Everyone seems to have their own method and technique for applying a finish to a model.

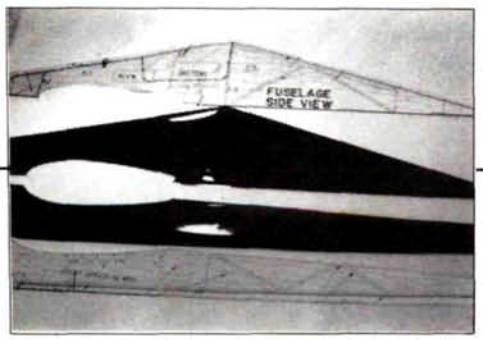
Essentially there are six distinct methods of achieving a final finish. Assuming you're working with a balsa structure, there is Japanese tissue, Silkspan, silk, fiberglass cloth, heat-shrink mylar, and heat-shrink fabric. In subsequent "how-to's" I'll explain all of these methods, but for now let's concentrate on the easiest—heat-shrink mylar.

Without going into great depth on the history of its development, let me say that heat-shrink covering is one of the products that virtually revolutionized the hobby, not only for R/C but all other aspects as well. Although relatively slow in its acceptance by the modeler, film-covered models ultimately became the norm rather than the exception. Why? Primarily because of reduced covering and finishing time. Introduced to the modeling fraternity in the mid-1960s by Top Flight Models*, it was not an overnight success. The original MonoKote was sold in sheets much like their trim sheets of today, only larger. The adhesive was wet and it took some doing to figure out how to work it properly. Then in May 1968 Top Flite came out with a dry adhesive version sold on rolls and they haven't looked back since. From that time on, modelers took to heat-shrink covering like bees to honey. Suddenly silk, Silkspan, dope, Japanese tissue, and any other type of covering was obsolete, at least for the average sport modeler.

Tools include heat gun, sealing iron, razor blade, and steel straightedge.



Author uses plans for cutting covering material.



Color patterns for covering should have a slight excess on each edge.

An attractive eye-catching color scheme is easy to accomplish and separates your model from the rest of the pack.

Building

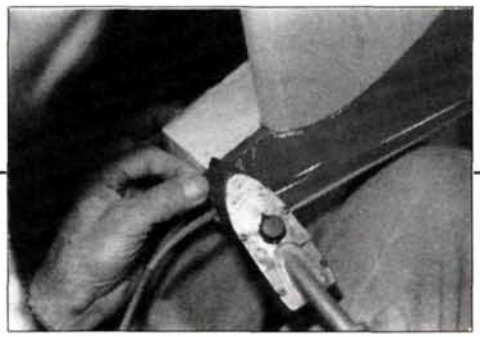
PART III

Covering

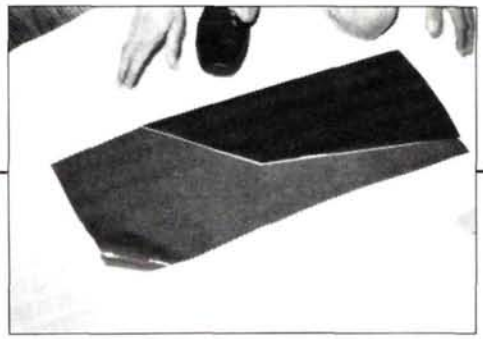
An easy way to get dynamite results.

Even the eyes of the perfectionists in high-gloss finishes were opened, however, when the Toledo Conference began awarding a special class for heat-shrink covered models. Some of the most beautiful creations ever seen were displayed. The view toward this type of finish on a model was not only given credibility, in many cases they were better looking than the traditional high-gloss dope finished models.

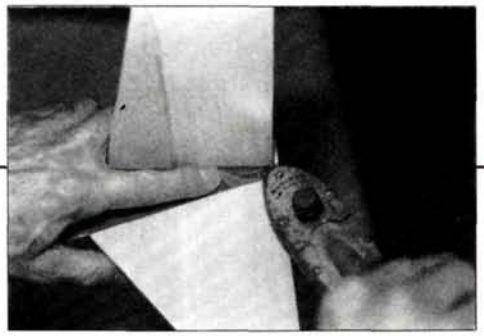
One great benefit of film covering is its ability to shrink when heat is applied, either directly or when hot air is blown over it. Since "dry" covering was introduced, the heat also affects the adhesive



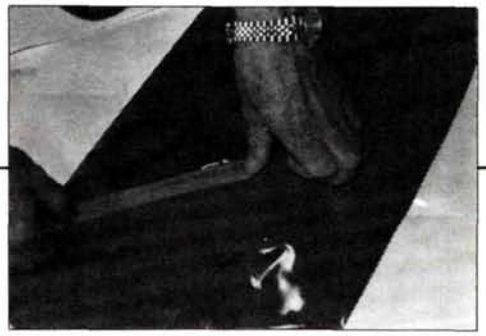
Lay the material in place and tack edges with sealing iron.



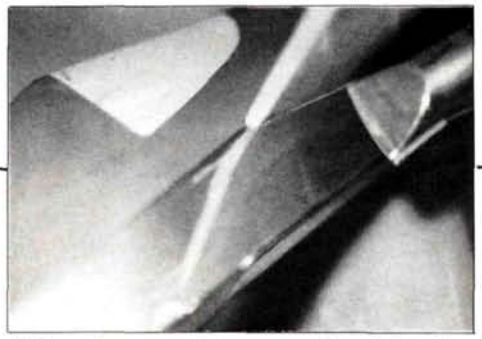
To have multicolored patterns on open areas such as a wing panel, first cut the color and size that you want.



Fillets such as the stab area are easy to do if you follow this method.



Overlap the lighter color with the darker color by one-quarter to three-eighths inch and scotch tape the pieces in place.



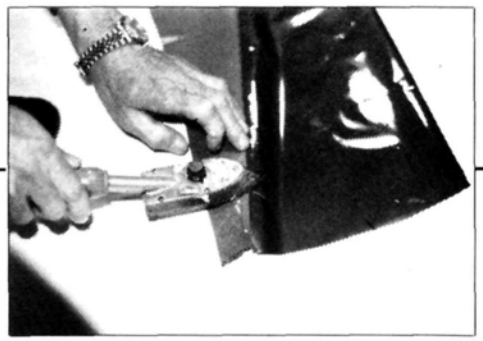
When edges are sealed, you can then shrink the remainder by using a heat gun.

Using balsa strip as a sealing guide, place covering splice directly on strip.

by a softening process which makes it tacky. It just so happens that within the adhesive there is also paint pigment which gives the color.

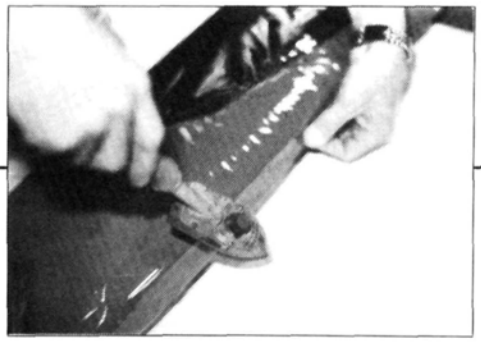
How much will this material shrink? Generally, any of this type of film will shrink to about 40% of its original size. Actually it can shrink more than that, in fact it will reduce its size to as little as 10% if continuous heat is applied. The problem is that when this much heat is put to it, it changes the molecular properties of the film, which can become brittle. What this means is that if some wrinkles develop after the model has been covered

(Continued on page 116)



With a piece of side down, slowly pull sealing iron the length of the seam.

Color will darken as heat is applied; pulling material will then stretch out any wrinkles.

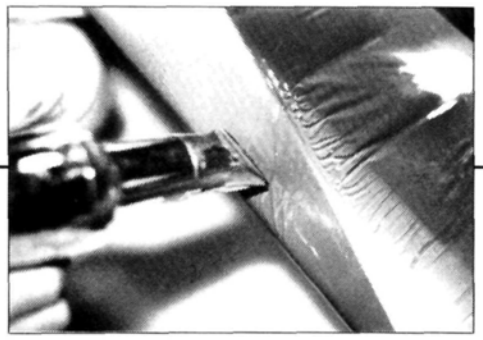


Using spliced piece then as you would a single piece of material, iron onto wing in regular fashion.

Completed wing tip prior to trimming. Note excess material for grasping.

Use iron for sealing edges around fuselage and wing perimeter.

Trim excess using a single-edge razor blade.



Use heat gun to shrink open areas, being careful around seams.

Striping colors are now ironed over seams.

Giant Steps

by DICK PHILLIPS

THERE'S A GROUP of people who add a great deal to our hobby. They've added something of interest to those of us who have chosen to build large models. They're the plans designers. Without them, the array of subject matter for our models would be much less interesting than it is.

While there are many kits available for the large model, they do tend to be somewhat expensive, with a few exceptions. Some of us are not really happy with building another kit, knowing there may be thousands of the same model in existence.

I've mentioned a few models here in the past that have caused a flurry of interest among my readers. Len Bosman's Boeing F4B-4 and Lysander are notable examples.

A model plan has recently come to my attention, one that I believe is possibly going to be another of these interesting plans. It's a J-3 Kitten, designed by Jim Messer* of the STARS club in Olean, New York. No, it's not just another J-3 and it has no connection with Mr. Piper's organization so far as I know. I must admit I don't know a lot about the Kitten and it isn't referred to in any of my documentation. It's a nice-looking airplane, about as gentle a flyer as you'll find.

Jim Messer has done a few plans and kits in the past and the plans show he is no stranger to the drafting board. They are well drawn and well laid out. In the plan for the kitten, Jim has done some innovative design work that may appeal to many of you. For example, the model is built from dowel stock to approximate the steel tube from which the original was constructed. A glance at the accompanying photos will show this clearly and Jim has substituted glue for the welds that held the original together. Most of the plywood used appears to be of the kitchen cabinet variety, and this will hold the cost of building the Kitten to a minimum. (Hardwood dowel is available from your local builders' supply in quantity* and cheaper than you'd expect.)

Jim Messer has several good-flying designs available in plans—the J-3 Kitten above is one of them.

The STARS are an interesting group. Despite the good-humored criticism and downgrading by their leader and scribe, George Privateer, they are a group of dedicated and experienced model builders. Their pioneering of a squadron of ¼-scale Sopwith Scouts many years ago (some of them still flying) was an example of the kind of work they do. Building the Kitten has been a club project with a number of their members attending an adult education woodworking class each week to construct a number of Kittens.

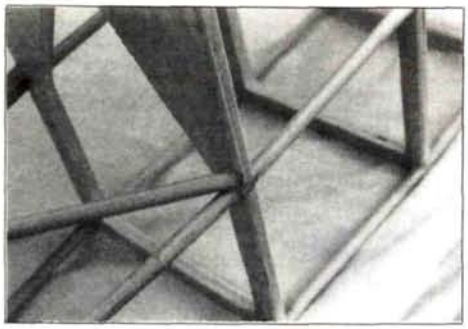
I am told that Jim Messer intends to make both the plan and a kit available for the Kitten. From what I've seen of it, it'll make an excellent and stable flying machine.

Special thanks to Lou Eltscher for the Kitten construction photos included with this column. Lou is currently spending a year at the National Air and Space Museum in Washington as a Verville Fellow and will be doing some in-depth research on the Curtiss and Curtiss-Wright companies.

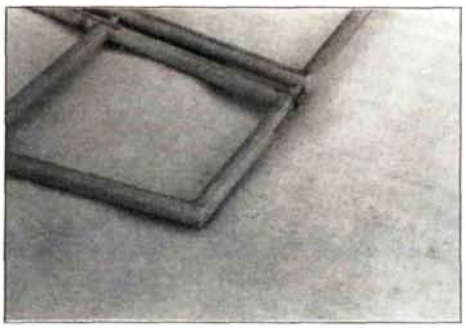
No one designer has a headlock on innovative design work. Others have pioneered methods and materials other than those we associate with the hobby. There are many materials that can be substituted for the traditional, and expensive, balsa and aircraft plywood.

For example, many parts may be made up from a material called foam board. There are many types of this material, which consists of a thin layer of styrofoam faced with either artist's board or kraft paper. They may readily be substituted for balsa in the manufacture of wing ribs, formers and other such parts and can be used in place of sheet balsa with a little care. The material comes in a variety of thicknesses ranging from ⅛ to 1 inch, and a 4x8-foot sheet of foam board is infinitely less costly than an equal amount of comparable balsa. Foam board is

No one designer has a headlock on innovative design work.



Fuselage former of cabinet plywood joins to dowel stock to produce strong yet lightweight structure.



Tailfeathers made up from dowel stock. Such work requires care and attention to produce strong and accurate assemblies. (All photos courtesy Lou Eltscher of the Olean STARS.)

Center section builds to fuselage, wing panels mount separately. Note the corner bracing of the crossmember and the way the dowel is recessed inside the rib.

available through builders' supply, art supply and graphics houses.

Another good material from your local builders' supply is called door skins. It's actually 1/8-inch mahogany plywood and is available in 4x8-foot sheets at prices far below aircraft-grade plywood. It, too, may be used to make the thin plywood parts we use so much, and at substantial savings off the cost of conventional materials.

Spruce stick wood is used a good deal in the construction of the larger model and it can be quite expensive, and hard to come by. (I'm always amazed that so few hobby shops will stock such material for us, especially in the longer lengths we need.) There is a solution, especially if you have access to a table or radial arm saw. You can buy Sitka Spruce boards from home-built-aircraft supply houses at attractive prices. These may then be ripped into the appropriate sizes for your latest construction project. The use of a carbide-tipped planer blade will produce wood strips ready for the building board. No further preparation is necessary. The nice thing about this wood is that it's available in a variety of lengths. For example, I find 8-foot lengths of such wood ideal for the cutting of spars and fuselage longerons and they come off the saw ready for use, without having to splice them to make pieces long enough to suit our plan.

I have occasionally found a 2x4 in the lumber yard that is straight-grained enough to use for model construction; and I can tell you, one 2x4 will produce enough stick stock to build a lot of airplanes. These finds are rare, but if you keep your eyes open, you too will find them from time to time.

Many of the lightplane-home-built supply houses have glider-grade Dacron available. My use of this material for covering models has been very successful. I use an envelope method of covering models, but they may also be covered with this light Dacron using conventional methods. Coverite's Balsarite can be used as the adhesive and it works well. Also, the structure can be painted with clear

(Continued on page 117)

O.S. FF-240

(Continued from page 72)

allows the engine to rev at higher rpm than it achieves on an 18x8 Zinger, as it will then speed up to beyond the rpm at which maximum power is developed.

According to the curves plotted from torque v. rpm readings obtained with the test engine, the Pegasus delivers its peak power output at exactly 9,000 rpm, where (see graph) a figure of almost 3.0 bhp was determined. This is very good. Despite its conservative valve timing, the relatively small effective carburetor throat area and the seemingly restrictive shape of its inlet manifold, the Pegasus obviously loses very little, power-wise, compared with a good flat twin of similar displacement, such as the FT-240 Super-Gemini. Torque is better still, the maximum figure recorded being 385 oz. in. at around 6,000 rpm. This is the equivalent of a brake mean effective pressure of over 124 lb/sq. in., which is comparable with the best twin-cylinder four-strokes tested to date in these reviews.

Unquestionably, the Pegasus is a most desirable hunk of model airplane engine... We have to confess, though, to a head-scratching problem: no engine is perfect, but we couldn't find anything to complain about. Oh yes, it is slightly heavier than its twin-cylinder stablemate, the Super-Gemini, and it is quite a bit more expensive. Beyond that, if the Pegasus has an Achilles' Heel, we will have to leave it to users to discover.

Peter Chinn, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

FROM COCKPIT

(Continued from page 22)

Skyote. We were 10 feet in the air and I was madly in love. Something about the way the stick talked to me was so familiar and perfect that I knew where I was: pilot heaven, also spelled "Jungmiester."

At altitude, I didn't mess around with all the pilot report stuff. I didn't have the patience to do a stall series, or the time to climb. All the measuring I wanted had to do with putting the horizon in unusual locations. The first roll was a four-point hesitation number. The second had eight points and the third had 16, or maybe 15. The airplane could be indexed around like it had predetermined attitude stops for each point.

I didn't do a loop because I knew it would do it easily, so, as I pulled the nose up over the top and saw the ground over my head, I picked a farm house that was

(Continued on page 86)

FROM COCKPIT

(Continued from page 83)

45° below me and rolled out with the nose on the back bedroom. Half a Cuban eight; second half coming up.

The next time the horizon showed up in a loop, the stick came back into a corner hard, with full rudder following it. The little bird odediently snapped around and stopped as soon as I reversed things.

In level flight, I found the snaps to be exactly what I expected...like a Bucker. With practically no technique other than hard elevator and rudder, the airplane could be made to instantly snap around, and would stop just as quickly. Snap rolls are what made the Jungmiester famous and the Skyote is just as good. Knife edge to knife edge, half snaps, snap and a half—you name it, it'll do it.

This has to be one of the most fun-filled airplanes ever invented!

I'd been told to hold 55 mph on final, which is really funny considering even the Cub comes in at 60 mph. With the wind, it seemed we were hardly moving and when I leveled out, we practically stopped. Amazingly, the airplane still had quite a bit of float in it, so I could probably have shaved a nickle off the approach and come in at 50 mph instead. Naturally, ground roll practically didn't exist since we touched down at 35 mph or so.

It's hard to tell how many Skyotes have actually been built because it's not the kind of airplane you fly 1,000 miles to show off at Oshkosh. At 110 mph cruise, cross countries just take too long. Of course in today's world, where composites and quick-to-build designs predominate, a rag-wing biplane is bound to be left in the dust. Something that does make the Skyote a bit different is that the wings are an all-aluminum structure covered in

(Continued on page 95)

Bob Violett Models'

AGGRESSOR

by FRANK TIANO

The thrilling experience of R/C jet cruising is apparent in this ducted-fan kit.

THIS REVIEW is gonna be quick and right to the point. A few months ago, I wrote a brief article on Bob Violett's* then-new Sport Shark kit for ducted fan application. Besides a simple rundown on what you could expect from the kit, we talked about general building procedure and flight performance. We offered that type of review because at the time Bob was just releasing the new Sport Shark and we wanted to be *first with the most*—and all that jazz. Well, a few months have gone by and I've finally built my own version of the Sport Shark, and would very much like to share some of the more enjoyable aspects of this project with you.

Since the introduction of the first Sport Shark, there have been many refinements and additions you might not be aware of. For instance, you may now order the Shark with a swept fin for a racier appearance. Or you may opt, as I did, for the newest creation, the Aggressor, which looks very similar to an F-5 or F-20 jet fighter. That's what I did because I strongly believe in Dave Platt's remark, "There are only two kinds of aircraft as far as I'm concerned, Fighters and Targets!" One look at the pictures will tell you that there just ain't no doubt this baby looks like a fighter.

THE KIT. The Aggressor builds just like the Sport Shark, that is, you get the factory-built, pre-sheeted wings featuring Magnalite-and-balsa construction for undeniable accuracy, strength, and durability. The fin and stabs are pre-built too. A gorgeous epoxy fiberglass fuselage is included with the hatch molded separately for an easier fit. In fact, there are many glass parts included in the kit, which really do aid the builder not only by saving time but by removing the aggravation as well. In my case, I ordered almost everything needed to finish the Aggressor right from Bob Violett Models. The only items I found elsewhere were the Futaba* radio and the glass cloth from Dan Parsons.

ASSEMBLY. If one were to follow the instruction booklet provided with the kit, I'd say you'll have a ready-to-prime aircraft in about three weeks of part-time work. Everything pretty much clicks together like a fine watch. There are specific measurements called for here and there to provide help for even the most negligent builder. The flying surfaces can either be glassed or covered with an iron-on film. The choice is yours, but I highy recommend going the glass route for increased durability. The Viojett propulsion system has done all the intricate assembly work for you so it's no big deal to install. There're even step-by-step instructions to get you through the most menial tasks. All the duct work is pre-formed so there's no hassle there either. The top hatch is already molded for you, the bulkheads die-cut, and the main gear mounting plates installed. Another nice feature is that there are alignment marks molded in the fuselage—you'd really have to go out of your way to get the wing stab mounted at the wrong incidence! The Aggressor, like the Sport Shark, does have a removeable wing, so carting it around is no problem at all.

PERFORMANCE. The Aggressor can be summed up in a word, Outstanding! This airplane has one of the widest envelopes of any airplane I've ever flown. It can be flown at ridiculously low speeds with confidence yet it can blister through the timing traps in excess of 150 mph. It's so clean that I don't recommend coming out of a split heading straight down at full throttle since the aircraft would almost certainly exceed 200 mph, and I don't think the design has been given the Good Housekeeping Seal of Approval for much over 175! And even if

(Continued on page 118)

FROM COCKPIT

(Continued from page 86)

fabric. The fuselage, naturally, is steel tube.

As a ¼-scale model, the Skyote would be a stand-out winner. Using a Kavan four-banger up front, you could really do a scale number on the airplane. Better than that, however, the model would undoubtedly fly at least as well as the real airplane. All of its moments and areas are such that bringing it down in size wouldn't hurt its flight characteristics at all. Of course, that out-rigger gear would test your building savvy since you couldn't cheat with a bent aluminum, sheet substitute. Or could you?

Once you've gotten the model off the ground you'll see why it's a great investment. As for the real one, Pete had to halt his sales on plans and partial kits due to the crisis over insurance. Except for the few now built and flying, a model of the Skyote is all you'll ever see. A pity. ■

R/C NEWS

(Continued from page 25)

look at Futaba's latest at that time.

Eyeball Revisted

Back in 1967, I designed a pattern airplane called Eyeball. The .60-powered machine was an in-line design with common datum line for thrust, wing airfoil center line and stabilizer. It was subsequently published as Eyeball II in August 1969 *Model Airplane News* and was kitted by a number of companies in various formats. The in-line concept was carried further in the ½A Eyelash and a .40-powered Migiball (the best of the series). The original .60 bird changed over the years, mostly in styling (it did get a lot better looking) and fuselage length (extended, to smooth it out as pattern schedules changed); and wing planform went to equal taper.

Anyway, there wasn't really that much innovative about Eyeball except its single datum line, based on simple reasoning that a pattern airplane spends as much time inverted as it does upright. If that is so, it ought to be aerodynamically similar in its various flight positions. After all, a low-wing airplane becomes a high-wing airplane when inverted. Well, it all worked and Eyeball had a nice run in contests all over the world. And it did have an effect on design as wings on other airpianes were moved much closer to the thrust line by their designers.

All that was very fulfilling, one of my very best R/C memories. In fact, I recommend attempts at design for anyone—there's no greater kick than seeing something you've created built and flown by another R/Cer.

What has surprised me is the number of letters over the years praising the Eyeball design. And, in recent months, numerous plan requests or requests for information on kits. Sorry, guys, anyone who ever kitted Eyeball is now out of business (except Svensen in Europe), which may tell you something!

Part of this "problem" has come from a statement I made awhile back that I was contemplating a turnaround Eyeball for 1.20 four-strokes. For a variety of reasons (excuses), I haven't delivered. But in view of the many letters received, I promise the new version will come soon. So, please don't keep asking for plans on the old Eyeball.

For those who can't wait, there are some parameters to look at. First, the old Eyeball had a serious flaw stemming from a one-piece wing. That mounting system insured a broken fuselage at the wing's leading or trailing edge in a bad landing. I have numerous fish heads (or tails) to prove this is so. To eliminate this problem, the new Eyeball will have a two-piece wing mounted on a 1-inch tube *a la* the many Laser airplanes around. By the way, the Laser is very close to an Eyeball.

Span will be 80 inches with a center chord of 15 inches and tip width of 10 inches, to give about 1,000 square inches of area. Fuselage will be 56 inches with a maximum width of 3¼ inches. Stab will be airfoiled and proportional to the original stab/wing ratio. Equal taper proved best on the original so it will continue on the new Eyeball. Airfoil shall be the same as the original, it was the same foil as Hal deBolt used in a number of designs. Frankly, half of Eyeball's magic comes from that airfoil. Root thickness percentage will be 15% and tip 13%. The airplane should be near perfect for big four-strokes. I'll do it this year—that I promise to all kind enough to write.

1987 Lee Renaud Memorial Contest

Joe Beshar has developed a nationwide contest in association with Airtronics to honor the memory of Lee Renaud, who did so much for modeling as a designer, competitor, staunch supporter of modeling activities and as founder of the well-known Airtronics firm.

(Continued on page 98)

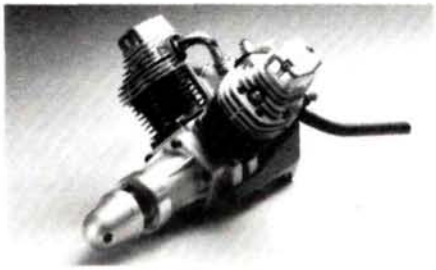
Product News

1/6-SCALE CITABRIA

The Citabria from Sig Manufacturing Company (Montezuma, IA 50171) has been pleasing scale R/C pilots since its introduction in 1968. Now the kit has been brought up to modern Sig standards with a brand new illustrated instruction booklet. Some improvements to scale appearance were made, but the basic rugged construction has been retained. The flat-bottomed high-lift wing gives the Citabria gentle flying qualities, but it will also stunt like its full-scale counterpart. The wingspan is 69 inches, the wing area is 740 square inches, the length is 47 inches, the weight is 6½ to 7 pounds, and recommended engines are a .35 to .50 two-stroke or a .45 to .61 four-stroke.

SS40

Super Sport technology is used to make this .40 cubic inch engine a real standout. The steel cylinder is nitrogen gas hardened for longevity, the cast-iron piston is fitted for ideal fast break-in and great running power, plus the crankshaft is running in a bronze bushing for smooth operation. The SS40 delivers 0.9 to 1.1 hp and 15,000 rpm power with its Schnuerle-ported lapped piston/cylinder. Each SS40 comes with easy-to-adjust standard carburetor and a quiet low-loss M402X muffler. Best of all, the SS40 comes with a reasonable price tag. For more information, contact Altech Marketing (P.O. Box 286, Fords, NJ 08863).

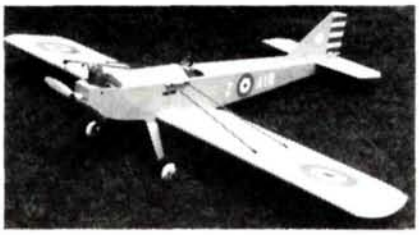


VT-240

The Enya VT-240 from Altech Marketing (P.O. Box 286, Fords, NJ 08863) is a 2.4 cubic inch (40cc) four-cycle engine with two cylinders banked at 80° from each other. Dual carburetors are hooked to a common throttle lever and a special fuel divider joint for efficient carburetion and control of the separate cylinders. Only three timing gears are needed to control the two sets of overhead valves. The cylinder liners are steel with ringed aluminum pistons. The power output of 3.2 hp is achieved at 10,500 rpm with a usable rpm range of 1,800 to 11,000. The ⅜-inch crankshaft with UNF threads makes the selection of spinners much easier. Each engine comes with its own radial mount for quick installation. A special glow-plug clip set is provided and an optional special dual muffler set will be available. The Enya VT-240 will lift 13- to 22-pound airplanes while contributing only 3.7 pounds of its own weight. Propellers from 16x8 to 20x10 can be used, with maximum performance coming from a combination of propeller and fuel that will give 7,500 to 9,000 rpm on the ground.

SERVO S136G (S36G)

New from Futaba (555 W. Victoria, Compton, CA 90220) is this compact landing gear retract servo. Measuring 0.87x1.75x1.0 inches, the servo has a transit time of 0.50 sec./60°. Weight/torque is 1.48 oz/76.4 oz-in.



1929 MONOPLANE

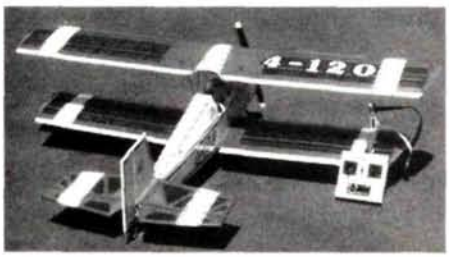
The 1929 Monoplane from Z-Planes (1659 W. 98th Pl., Crown Point, IN 46307) is a smooth flyer and a good first big bird. The Monoplane has a wingspan of 80 inches, a wing area of 1,000 square inches, a fuselage length of 50 inches, and an assembled weight of 10 to 12 pounds. This big bird will be a perfect match for a .90 to 1.20 four-stroke, a .90 to 1.08 two-stroke, or even a Maloney 100 gas engine. This and all other Z-Planes kits include Lexan-covered foam turtledecks, Lexan wing covers, and wood parts that are machine and router cut for the ultimate in precision. The Monoplane kit includes a built-in finish on wing and fuselage, balsa tail, hardware package, formed aluminum landing gear, and fuselage sides covered with artcor.

ATTACK 2NBL/AM

The Futaba (555 W. Victoria, Compton, CA 90220) Attack 2NBL/AM two-channel system is ideal for the beginning R/C enthusiast. Attack systems feature two-channel integrated Battery Eliminator Circuitry, which extracts the highest level of performance from your model. BEC provides regulated power to the receiver and servos from your model's motor Ni-Cd pack, thereby reducing weight. The system's specifications include two S128 servos, switch harness, and R102GF BEC, 27, 72, and 75 MHz.

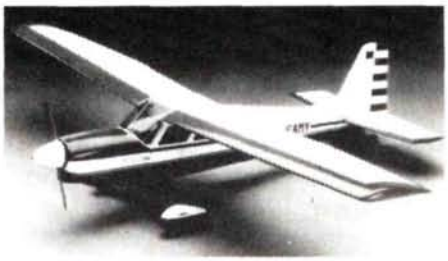
PIC APART DEBONDER AND CLEANER

This water-based liquid from Penn International Chemicals (943 Stierlin Rd., Mt. View, CA 94043) softens and removes cured cyanoacrylate residues from hands, tools, clothing, and work surfaces, without damaging most plastics or leeching clothing dyes. Apply, allow to penetrate, and wipe away softened residue. To debond parts, apply, allow to soften exposed layer of glue, scrape away gummy residue, work parts to loosen. Also removes permanent felt marker ink, paint and paint overspray, fingernail polish, and most anything else. Sold in 1-fluid-ounce bottles with dropper dispener tip, it's available at leading hobby stores.



4-120 BIPE

The latest from Ace R/C's (116 W. 19th St., P.O. Box 511C, Higginsville, MO 64037) tremendously successful "4-Cycle Squadron" series is the 4-120 Bipe. With its large size, it's a dream to fly: slow, smooth, aerobatic, and stable. Pop/ ply, spruce, and balsa construction make for a strong model. Kit comes with canopy, decal sheet, fiber-filled landing gear, complete hardware package, and thorough and informative plans and instructions. Wingspans are 70 and 62½ inches, total area is 1,624 square inches, length is 61 inches, engine required is 1.20 four-cycle, and channels are 4.



GRAUPNER TAXI 2000

Graupner's Taxi 2000 has a 75-inch wingspan and a huge 824-square-inch wing area. Taxi 2000 is a pre-built balsa/ plywood and sheeted foam wing kit that only requires assembly of the main components, attaching the control surfaces and R/C gear, and covering. Designed for .60 to .90 four-stroke engines (you can also use .50 to .90 two-strokes), Taxi 2000 includes flaps and a special hardware package, featuring the Fowler-type flap hinge system. Tremendous attention to detail is typified by the plywood cabin window frames which are actually countersunk to the depth of the window material. For more information contact Hobby Lobby International (5614 Franklin Pike Circle, Brentwood, TN 37027).

ST HELICOPTER ENGINES

SuperTigre, distributed by Great Planes Model Distributors Company (P.O. Box 4021, Champaign, IL 61820), has added four new helicopter engines to their line of superior R/C model engines. These engines are based on the proven S-Series and feature a unique ABC piston/sleeve as well as a ringed piston. These engines also feature Schnuerle porting, ball bearings, specially designed heat-sink heads, and new adjustable mufflers. Available in four sizes—.29, .45, .61, and .90—these engines offer the traditional SuperTigre quality, performance, and reliability.

KITTIWAKE

Top Flite Models (2635 S. Wabash Ave., Chicago, IL 60616) introduces KittiWake, a single-float seaplane capable of point rolls, left and right spins, spectacular snap rolls, and smooth inverted flight. It's sized and designed specially for .19 to .28 two-stroke engines. Add the regular landing gear option to be ready to roll on dry land. Wingspan is 47⅜ inches, wing area is 334 square inches, length is 40¼ inches, weight is 3 to 3½ pounds, and 4 channels are required. Precision die-cut ply and balsa parts, fixtured wing ribs, a complete hardware package, full-size plans, and illustrated instruction manual make for fast, accurate assembly.

PIC PRONTO ACCELERATOR

Accelerator freezes the surface of cyanoacrylate glues, causing them stop flowing as liquids and forcing them by catalytic action to finish curing. The result is enhanced fillet-forming and expanded gap-filling action. Filleting bond joints provides greater load-carrying ability and distributes forces which act on the joint. Pronto, from Penn International Chemicals (943 Stierlin Rd., Mt. View, CA 94043) works on all cyanoacrylates and also assists "skinning over" of PIC Poxy adhesives. Sold at leading hobby shops as a 2-fluid-ounce bottle with finger pump sprayer and as an 8-fluid-ounce refill.

R/C NEWS

(Continued from page 95)

The contest is a single event based on the R/C Assist, ½A Texaco Old Timer event. There are minor changes and *any model is eligible* providing it is powered by a stock Cox .049 Black Widow engine.

Clubs may run this event either on its own merits or as part of a larger meeting. Prizes for each event run around the country will be provided by Airtronics and results must be reported prior to December 1987 when Airtronics will hold a sweepstakes for first place winners. Grand prize will be a choice of any Airtronics system. Airtronics prizes must be awarded only for this memorial and the event must be announced as an open "1987 Lee Renaud Memorial—Old + New ½A Texaco RC AMA Contest." Joe Beshar, National Director of this event, will be running one of the memorial events as part of this year's Nats in Lincoln. Rules are as follows:

A Cox .049 Black Widow Motor must be used without modification, substitution or alteration, except to move fuel pick-up from middle to bottom of the tank (capacity is 8cc).

Any model qualifies.

Procedure and Flight Rules:

Fill tank with any commercially available glo-fuel.

Hand-launch model, allowing motor to run out of fuel to obtain maximum endurance total flight time, not to exceed 15 minutes.

Score one (1) point for each second airborne from hand-launch to landing or out of sight. Score for flight over 15 minutes is penalized one (1) point per second and deducted from 900 (score for 15-minute flight).

(Example: Score for a 15 minute, 20 second flight is 900 minus 20 = 880 points, where a score for a 14 minute, 50 second flight is 890 points.)

An official flight is one that lasts over 2 minutes. Four (4) attempts are allowed for two (2) official flights; first two official flights totaled completes score with no further attempts allowed.

For your club to participate and receive free awards and an opportunity for the final sweepstake, complete the following steps.

1. Announce and schedule an open "1987 Lee Renaud Memorial"—Old + New ½A Texaco RC AMA Contest.

2. Obtain contest sanction from AMA in accordance with standard procedure.

3. Have contest director complete registration form and forward, addressed to 1987 Lee Renaud Memorial Contest, c/o Airtronics, Inc., 11 Autry, Irvine, CA 92178. Upon receipt, Airtronics, Inc. will forward contest awards at no charge.

4. After completion of contest, send copy of AMA Contest Form #10, first place winner's name, score, complete address, phone number, and AMA number to Joe Beshar, 198 Merritt Drive, Oradell, NJ 07649. Check with Joe Beshar at his address or (201) 261-1281 between 7:00 and 10:00 p.m. Eastern time for more complete information.

I hope you're well into your building 'cause flying season is just around the corner and I'm hoping to see you at the field.

Art Schroeder, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

Futaba Corporation of America, 555 W. Victoria, Compton, CA 90220. ■

WARNING DEVICE

(Continued from page 50)

information gained here to wire the mating connector (Step 5) to insure the

proper polarity and signal connections to the transmitter alarm printed circuit board.

5. Solder the three wires on the mating servo connector into the appropriate holes on the transmitter alarm printed circuit board. Refer to the data gained in Step 4 and Figure 3. The wiring of the plus, common, and signal points on the alarm printed circuit board must agree with the respective mating points on the receiver connector.

TESTING.

1. Plug the connector on the alarm printed circuit board into an unused servo output connector on the receiver module.
2. Turn the transmitter off.
3. Turn the receiver on.
4. The LED warning lamp should be illuminated.
5. Turn the transmitter on.
6. The warning lamp should extinguish with the transmitter turned on.

NOTE: If the warning lamp does not operate as noted in Steps 4 and 6, turn off the receiver and check the wiring to the LED and to the servo connector. Be sure you have the correct polarities. If all is okay with the wiring, proceed to the circuit description (Figure 5), the troubleshooting chart (Figure 6), and the schematic (Figure 7).

In practice, when the warning lamp is illuminated it means that no one in the immediate vicinity is operating on your particular frequency. Therefore, it should be okay to operate your transmitter and your model. Conversely, should the warning lamp be extinguished, it indicates that someone is operating on your frequency and you *should not operate* your transmitter. Before utilizing the adjacent transmitter alarm, be sure you fully understand the meaning of these two states of the warning lamp: Lamp On = Go. Lamp Off = No Go.

Be sure to test both warning lamp states before flying, but never turn on your transmitter if your warning lamp is off.

INSTALLATION.

1. Before installing the alarm printed circuit board into your model, wrap it in a generous layer of soft foam to reduce the effects of vibration.
2. Exit the head of the warning lamp through a small (¼-inch) hole in the side of the model. Keep it out of oily slipstreams. Secure with a drop of glue, or utilize a standard LED holder.
3. Due to the washout characteristic of LEDs in bright light, such as sunlight, it will be necessary to cup your hands over the LED in order to see if it is illuminated or not. This is a small price to pay for its advantages.

**The following is the address of the company mentioned in this article:*

F&M Electronics, 41 Chesnut St., Seymour, CT 06483. ■

GOLDEN AGE

(Continued from page 53)

before being put aside for other interests.

As with many early R/Cers, two years ago David got interested again. The Cub wing and tail were fine, so he built a Tri-Squire fuselage and came up with a hybrid Cub-Squire!

With our ongoing search for OT information, we're happy about the responses we've received. Another writer is Charlie Reed of Kansas City, who tells of early day flying with a Kicking Duck system, another name for Galloping Ghost. Charlie also talks about the trials of winding ultra-fine wire onto Toroid coils for a three-channel Marcy Tone that he got flying. He tells us, sadly, that Marcy Inkman passed on two years ago. Charlie never used escapements but had good luck with Fred Sage's ceramic magnet actuators. We also should know that Ace R/C is in the Kansas area and provided

(Continued on page 102)

DUKE'S MIXTURE

It is not true that Florida is the land of eternal sunshine. My wife and I drove down to Orlando to visit the Tangerine meet over the Christmas and New Years holidays. It was colder than at home in Arkansas, and I came away with a case of the sniffles. It is true, however, that the R/C World Field in Orlando is one of the finest that I have ever seen, and that the club knocked themselves out to put on a Grade A event.

I have been spending quite a bit of time exploring ways to make slightly quieter, quite a bit quieter, and really quiet 2 cycle model airplane power plants. One of my purposes for making the trip was to find out whether interest in quieter airplanes is real, or whether it is just lip service. I am sorry to report that of over 150 modelers I talked to in Orlando, not one single modeler wanted to hear any more about it. I may be slow to catch on, but I am not going to spend anymore time or money promoting quiet. In case you might feel differently than I, I have compiled my findings on sound in a report that I will send to anybody that desires, if they will send me a self-addressed envelope with two stamps on it.

What is this Long Stroke Jazz? Four years ago we introduced our Eagle III. A truly superior 60 we thought. The world would surely beat a path to our door. It didn't quite work that way however.

Our competitors quickly found out that our Eagle III outpulled theirs. Since our 937 stroke was longer than theirs, that must be the reason why. Presto — Now you can buy long stroke 60's in Scalopini, Snitzel or Oriental flavors.

But Fellows — Our 937 long stroke isn't why our 60 is still the strongest on the market, and if you think we are going to tell you why — you are dreaming.

Happy Flying.

Duke Fox

GOLDEN AGE

(Continued from page 99)

much help to early R/Cers. Their "Grid Leaks" publication was a gold mine of info. Charlie turned over all of his early equipment to Ace R/C.

With so much of our heritage emerging through this series, I hope that our readers get a feel for the men and the genious of these men who made it all possible.

Hal "Pappy" deBolt, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

BLACK BARON

(Continued from page 57)

marking out where the formed cockpit decking will fit. We did so and then marked where the wing bolts would come through for access. Don't forget this or you'll never get the wing off of the unfinished fuselage.

Once the entire skeleton of the aircraft is done, the airframe can be covered. We opted to use all Coverite products for this project. On the wings, we used Black Baron Film, an iron-on all-purpose covering film. We had no trouble applying the Black Baron film, and were rewarded with a wrinkle-free finish. On the fuselage, we used Black Baron Epoxy paint. This is an epoxy-based paint in an aerosol spray can, making application quite easy. One note: be sure to sand all plastic surfaces with fine sandpaper before spraying with any paint. Otherwise, you may get some peeling later on.

The engine used in our Black Baron Special was the famed K & B .40. This engine has been around for a long, long time and is probably the most successful .40 engine ever made in the U.S. The K & B .40 was equipped with a twin-needle K & B carburetor and bolt-on muffler. The K & B is a cross-flow scavenged design utilizing a ringed piston inside a steel cylinder sleeve. The crank is ball-bearing supported and is suitable for sport, general-purpose flying applications, and even pylon racing. A vertsatile engine indeed.

The radio used was the latest offering from Airtronics*, the Module Series 7P. This radio replaces the previous Competition Series radio with even more features than ever and with dedicated transmitters

(Continued on page 104)

BLACK BARON

(Continued from page 102)

for the Pattern, Sailplane, Helicopter, and Scale pilots. The 7P version is the Pattern version, which is more appropriate for sport application.

The Module Series radio features servo-reversing on all seven channels, end point and throw adjustment, flap-to-elevator mixing in three separate settings, dual-rate elevator and aileron control, snap roll button and snap roll programming switch external. The front face has a timer/stopwatch function, power and warning lights, RF/Power meter, control access hatch for all controls, and neck strap lug. If that's not enough, the transmitter is ergonomically adjustable to the pilot through its adjustable length sticks and stick tension. A carrying handle rounds out the transmitter. On the back is the RF module which removes for frequency change outs, and a removeable power pack for the 9.6-volt Ni-Cd battery pack. It's a lot of radio!

The compact receiver is touted as the first true 1991 type to date, with dual-conversion FM modulation. All present Airtronics servos are compatible with this receiver. By any existing standard, this radio system should last well into the next century.

The servos used in our Black Baron were Airtronics type 14631 standard servos. These feature high-speed operation and high torque. Measured speed was .4 seconds for a 90° rotation. Fast enough for most any application.

Installation of the Airtronics Module radio was no problem; there's plenty of room in the Baron. Once the ship is covered, engine is installed, and radio is made operational, it's time for a word of caution: read the instructions and follow them, or risk an experience like the one I had, which I'll get to.

FLYING. When we got to the flying site, the Baron was ready. We fired her up and upon launch—The plans called for a straight engine installation instead of *my right thrust*—the Baron took it, but couldn't do much to the left, only to the right. You'd think that by now a dummy like me would learn to follow the instructions and not second-guess them!

After Captain Dum-Dum put the engine in right, the Baron flew great—stable yet responsive in all flight modes with no nasty habits noticeable.

The real test is in the hands of the pilots who will fly the Black Baron Special, namely the low-hour pilots. With this in mind, we placed the controls of the Baron into the hands of several pilots at our local

flying field, then asked for their honest opinion of the plane on a scale of 1-10, judging the plane for its handling, stability, and control response. Not one of them rated the Black Baron Special less than an 8! That speaks highly of any aircraft in my book. All of our test pilots felt that the Baron was smooth and easy to fly with no bad quirks. One pilot even offered to buy the Baron on the spot!

What more can I say? The Black Baron Special coupled to the K & B .40 and the Airtronics Module radio is a *bear-on the run*, something you shouldn't miss.

Follow the plans and instructions, and you'll end up with a growling bird that flies even better than it looks. And the days of the ugly trainer will be just a memory.

**The following are the addresses of the companies mentioned in this article:*

Coverite, 420 Babylon Rd., Horsham, PA 19044.

Satellite City, P.O. Box 836, Simi Valley, CA 93062.

Airtronics, Inc., 11 Autry, Irvine, CA 92718 ■

AVANT-GARDE

(Continued from page 65)

The Avant-Garde is designed to be flown with either a .50 or .60 airplane engine; that is, one without a heatsink head. Supplied is a large heatsink that clamps to the engine head and is also used to mount the entire unit to the airframe. Attached to the engine is a small fan that forces air out the bottom of the airframe thereby drawing in cool air over the heatsink. This will provide more than adequate cooling even on the hottest days.

When installing the engine, be careful to check the gear mesh with the main gear. While holding the engine drive gear, move the main gear back and forth. There should be just the slightest play between the gears. If the mesh is too tight, use ½ mm washers under the engine mounts and then check again.

The tail rotor unit is also made largely of carbon fiber components and assembly is straightforward. One unique feature of the tail unit is that it's completely sealed, no holes or slots of any kind for dirt to

(Continued on page 107)

(Continued from page 105)

enter or grease to exit. So make sure you properly grease the gears and bearings during assembly because there's no way to do it later.

Also, balance the complete tail rotor blade assembly before mounting it on the output drive shaft. Notice the three small pieces of tape I needed to add to one blade to get it perfect.

I also like to file two flats on the end of the tail rotor drive wire, making them rather small so the wire isn't weakened. Then smear some Loctite on the drive wire and insert it into the tail rotor unit, screwing the two large grub screws, again with Loctite, onto the flats. The other end of the drive wire, which is connected to the main rotor unit, is designed so it can't possibly slip. There's a slight bend in the wire, which slips into a slotted connector and is secured in place with a brass cover. With this design, slippage in the tail rotor should be a thing of the past.

The two halls of the carbon fiber airframe are screwed together in minutes, providing a very light and strong structure to house the main components of the helicopter. There's also plenty of room in the airframe for all the radio gear, and it's nice to have that delicate and expensive equipment so well protected.

The canopy is different from those of most other pod and boom helicopters, which only cover a small portion of the nose, exposing most of the engine and frame for engine cooling. Because of the forced-fan cooling, this canopy is completely enclosed, giving a very sleek aerodynamic appearance and making the helicopter much easier to see in flight.

Final assembly begins with mounting the radio equipment and an explanation of the collective pitch mixer provided with the kit. The radio used was my trusty Futaba* PCM that has yet to give me anything but perfect performance. With all its adjustments and flying functions it makes helicopter flying a real joy, if not downright easy. Using the S-130 servos, the standard issue with the PCM, I mounted four servos side by side with the tail rotor servo mounted inverted, as the instructions indicate, and the aileron servo mounted in the mixer. Notice how the aileron servo is mounted to the mixer and has a takeoff from each side of the servo wheel to the swashplate controls. The collective servo is then connected to the airleron servo causing it to rotate back and forth, which adjusts the collective pitch of the rotor blades.

To my knowledge, this is the only helicopter that uses such a mixer for the collective, but it's such a simple and effective design that I can't help but wonder why the others don't use it. I've found the mixer to be completely foolproof and precise in even the smallest pitch changes, which is one reason why Heim mechanics has been winning contests throughout the world for several years. The plans also show a servo installation without using the mixer, but this requires your radio to have the European Cyclic Corrective Pitch Mixing (CCPM) function, which does all the mixing electronically in the radio. Steve Helms of Futaba was nice enough to add Futaba's CCPM option to my transmitter, but unfortunately it will not work with the Heim mechanics because it's not the same CCPM offered in Europe. I'm not sure about the CCPM mixing functions of other radios, so check their operation before mounting the servos.

As a closing note on the radio installation, there's enough room in the carbon-fiber airframe to hold the gyro, battery and receiver under the servos, where they receive the most protection of any helicop-

(Continued on page 110)

AVANT-GARDE

(Continued from page 107)

ter design I've seen.

The main rotor blades are of the top quality you'd expect from such a deluxe kit, and after light sanding with fine sandpaper they were ready for covering. Heat shrink covering is provided with the kit but I chose to use the black Rotorsport covering to keep with the basic yellow-and-black color scheme. The softer balsa used on the trailing edge of the blades is easy to dent, so before covering I put a bead of cyanoacrylate along the trailing edge of each blade, which adds quite a bit of strength for practically no additional weight. A white strip of tape was also added to one blade tip to aid in tracking.

The mechanics setup begins with static tracking the main rotor blades. Hold a ruler up from the tailboom and note the distance between the tailboom and one blade tip. Then rotate the head and check the distance to the other blade. If the measurements aren't the same, the static tracking is out—but this can be adjusted using two Allen screws just below the blade holders. This is a very important step in the setup process and must be done to eliminate vibration.

The pitch of the main rotor blades can then be adjusted by the movement from the collective servo. I use a Schluter pitch gauge, which is both easy to set up and has a large easy-to-read pitch scale. If you're using the Avant-Garde as a primary trainer to learn how to hover, I recommend that you restrict total pitch movement from 0° to approximately 4°. The helicopter will hover at about 3½° so the 4° max will give just a slight climb capability, but not enough to get you climbing too fast or too high. The 0° as a minimum setting will also keep you from slamming the helicopter into the ground should an emergency descent be required. For normal flying I found a range of -2° to 7° to be right for me. The -2° gives enough negative pitch for rolls and landings and the 7° as a maximum gives plenty of rotor rpm without lugging the engine. However, for autorotations I increase the pitch range to -4° to 10°. This negative pitch keeps the rotor rpm high while descending, and the 10° gives cotton-soft touchdowns.

This is where the Futaba PCM really shines because it allows you to program pitch settings for various phases of flight, which means I can have the 7° max for normal flight, but when using the throttle hold function for autorotations it automatically provides the -4° to 10° that I want. Also when setting the tail-rotor compensation in your transmitter make sure the mixing setting is set for counter-clockwise, or left, blade rotation.

As for connections to the swashplate, I set the throws at the servos to give full swashplate travel, but use the Futaba VTR feature to give a soft neutral for hovering. If you're not going to use VTR, or exponential, I recommend setting the dual rates on about 75%, which should be comfortable for hovering and flying with full travel being available for aerobatics. For those learning to hover, I recommend setting the swashplate travel at one half of the maximum available as a start so you won't over-control while practicing.

The Avant-Garde is extremely smooth and stable in both hover and forward flight. Its large colorful canopy is also very easy to see in flight, which really helps in doing aerobatics on a dark cloudy day. The Avant-Garde is capable of very fast forward flight, probably due to its aerodynamic canopy and light weight, giving large majestic loops. Rolls are smooth and axial, requiring about -2°

(Continued on page 115)

AVANT-GARDE

(Continued from page 110)

pitch while inverted to maintain altitude. Also remember that since main blade rotation is to the left, or counterclockwise, all rolling maneuvers should be to the left, or into the retreating blade. In summary, the Avant-Garde is as stable and easy to hover as any helicopter I've ever flown and yet is ready to perform the most advanced aerobatic maneuvers on demand. I'm sure we'll soon be seeing a lot of the Avant-Garde in the winner's circle.

Miniature Aircraft also carries a complete line of accessories for the Avant-Guarde, which includes a very quiet, low-power-loss muffler, their Magna pipe system and a custom-made header and tuned pipe. With all the vertical performance I have with the regular muffler, either of the tuned pipe systems should make this copter one of the hottest in the sky! Tuff Strut landing gear, virtually unbreakable, is just the thing for those hard beginner-landings or everyday flying. I use them on all my helicopters, and by the time you read this article Miniature Aircraft should be out with their new Tuff Strut II gear for smaller copters. Fly bar weights are also available to increase hover smoothness and stability, and the high-lift/low-drag Rotorsport blades give increased flight performance and a wider margin for safety during autorotation landings. And when you're ready for scale, Miniature Aircraft has several different fiberglass fuselages specifically for Heim mechanics.

There's a final topic I'd like to cover: the excellent support you can expect from Miniature Aircraft. During the course of this review I've had the opportunity to talk with Walt Schoonard and other members of his family and staff, and they're all dedicated to distributing and maintaining a quality product that you'll be happy and proud to own. Before they ever release a new copter, they build, fly and completely test it. Only when they're completely satisfied with its engineering, ease of assembly, flight performance, and have a complete line of spare parts in stock do they then put the kit on the market. This means that they have the technical expertise to answer your questions on building or flying, and quickly supply you with a needed part.

The Robbe Avant-Garde and Miniature Aircraft—a winning combination.

**The following are the addresses of the companies mentioned in this article:*

Miniature Aircraft, 2594 North Orange Blossom Trail, Orlando, FL 32804.

Graupner: imported by Hobby Lobby International, 5614 Franklin Pike Circle, Brentwood, TN 37027.

Futaba Corporation of America, 555 West Victoria St., Compton, CA 90220. ■

SUPRA-FLY

(Continued from page 70)

then mounts up, followed by a plastic trim piece and then the flying surfaces. A steerable tail wheel assembly finishes the tail.

The last thing I mounted was the canopy. Under this is a decal to decorate the dash panel with instruments. The

(Continued on page 116)

SUPRA-FLY

(Continued from page 115)

canopy fits right on and self-adhesive trim strips finish the job.

A whole load of trim decals are included in the kit to hide any seams or edges. On top of that is an extra plastic sheet to use for either hangar rash later on or to repair damage from other causes.

The Rossi .61 side-exhaust ringed motor, a well-proven pattern motor with plenty of gusto where it counts, Macs header, and Rossi pipe comprised the powerplant. Details on this combo worked out to a 1/16-inch pipe length hooked to a Yoshioka 11.5x10.2 prop. The rpm range was about 11,000 on the ground.

FLYING. The Supra-Fly tracks well on the main gears, lifting off in about 150 feet. It climbs like a solid bird, steady, defying its 7½-pound weight, fast and straight. All throws, as recommended, proved sufficient. She rolls nicely with a little aileron offset making it even better. The narrow elevators, the hallmark of Hanno's designs, are sensitive enough to make sharp corners of anything.

The Supra-Fly is truly contest-competitive right out of the box and capable of virtually all maneuvers. Is the Supra-Fly great? Bet on it. No other ARF ship to date can match it. Getting the Supra-Fly is the fastest way to grab hold of a good-looking, easily assembled, well-engineered, and contest-capable bird.

**The following is the address of the company mentioned in this article:*

Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728-8610. ■

SCRATCH-BUILD

(Continued from page 80)

for a while, they can be removed with the application of heat. Since balsa wood is a humidity sponge, it will expand and contract with the vapor content in the air. This is why on one day your model looks beautiful and the next day it's wrinkled up.

Although the ability of heat-shrink film to reduce its size with heat is a great asset, another often overlooked feature is its ability to stretch. Again with the application of heat, most film will stretch considerably. This quality comes into play when you have a tricky wing tip to cover or are going around the edge of a control surface. All you need to do is apply the heat and pull on the material. For the best results the film should not be stuck to the surface while shrinking since the surface material will act as a heat sink and inhibit the process. For example, if you're covering a wing tip and you want to pull out a wrinkle, you'll never get it out by pressing the film down with your iron. Simply lift it off the wood, apply your iron, and pull with your hand. As it stretches, lay the film back down on the edge of the wood and seal just the edges. *Voila!* No wrinkles!

As you can see, with the stretching and shrinking qualities of this material available to us, we can come up with a very nice looking model in a short period of time.

Just as in any worthwhile endeavor, proper planning is in order, and covering a model is no exception. Once you've decided on the color combination and pattern, it's simply a matter of cutting the material and putting it on, right? Wrong! The preplanning stage of covering is most important, and it will save you time as well as money. How do you preplan a covering job? Good question.

First, you need to know how much material you'll need. After a while you'll know instinctively, but for your first efforts the way to determine this is to measure your airplane and obtain the total number of square feet it contains. A roll of 6-foot covering film contains 13 square feet of material. How much will that cover? Let's say your wing has a span of 56 inches and the wing chord or width is 10 inches. To cover it on both sides you need almost 8 square feet of material (l x w x 2 ÷ 144). Add to this the fuselage and stab area and you can see that a 6-foot roll is adequate for small models but you'll need more for the larger ones. If you're going to use different colors you won't need all of it, right? Well, almost. If you use a multiple-color scheme you can use the same formula for determining the amount you'll need, but don't skimp. It's a good idea to add a 10% surplus factor for goofs.

Once you have your material, prepare the model for covering. This is no big deal except that the outcome of your model, and the way it looks, will depend on the way you prepare the surface. In all cases, it looks best when there's nothing but air underneath it, such as on an open area of a wing panel. Obviously, the places where there is a wood structure need to be accounted for. Mylar ironed to a balsa surface will assume the qualities of the surface beneath it. If you're covering a washboard, your end result will look like a washboard.

The way to prepare any surface for covering is to make it as smooth as possible. Do this by using an item some modelers seem to know nothing about—sandpaper. Make yourself a sanding block out of a piece of balsa that's about 3 inches wide and 5 inches long. It should be at least 3/8-inch thick.

Start your sanding task using a piece of medium (100-grit) open-coat sandpaper. Get the wood down to a somewhat smooth texture, then go to a fine-grit paper (320). Sand the model all over several times and then switch to 400-grit. At this point you'll begin to see a shine come to the balsa and it feels as smooth as a baby's bottom. Don't stop there. Now go over the surface with 600-grit paper

several times and the balsa will be as smooth as glass.

If you have a vacuum cleaner, use the brush attachment and remove all of the balsa dust from the surface. If you don't have one, use a tack cloth, a diaper, or an old T-shirt. The surface should now be clean and smooth enough for covering, which leads us to the real meat of this article.

With your model sitting before you, imagine the colors you would like it to be. Now take your roll of material and try to iron it on. Not too easy is it? Even if you cut a huge piece, strip off the backing and try to apply it, you're going to have a hard time. Sure, you'll eventually get it covered, but at a cost of a lot of extra time and wasted material. Here's a better way.

For virtually any model that I cover, I use the plans instead of the model for cutting the material. For one thing, the plans are flat, providing an easy layout. Also I can cut patterns exactly as I want them, lay them out, and arrange them before applying them to the model, with little fuss.

If you're covering a balsa surface, such as a fuselage, and you want a multiple color scheme, put the material in place and allow for an overlap of about ¼ inch. Now iron it down and shrink it out completely. Take your next color and do the same. When you shrink it out, be careful around the seam as you don't want it to pull apart. If you want a color strip between the two, leave an appropriate space and cut the strip with about ¼ inch overlap, top and bottom. Do this with as many different colors as you wish, just remember to keep the heat away from the seam.

Covering a wing panel where there is no supporting surface underneath can be tricky, but well worth the effort if done properly. Obviously you should try to keep any splices of material where there is a supporting structure beneath it. If, however, you want to do a color splash that runs the span of the wing and there's nothing under it but a rib every 2 or 3 inches, I've developed a technique that works quite well.

First I cut my material to the desired size and pattern. Next I overlap the material ¼ inch and tape it together on the top surface every 6 inches or so. I turn it over and run a strip of Scotch tape the entire length of the seam. I place the seam on top of a strip of balsa and tack the material at intervals of every 4 inches or so. Then I tack between these points, until finally I have the entire seam tacked in place. Then I slowly pull the iron down the entire length of the seam, sealing it permanently. When it cools, I turn the material over again and slowly remove the tape. Now you have a multi-colored panel that's ready to apply to your wing. Easy, wasn't it?

An important thing to remember is when you have the spliced piece of material in place on your wing and ready to be shrunk out; don't use your iron. Use it only to seal the edges, otherwise the seam can come apart when you hit it with your iron. Use your heat gun to shrink it out, and again be careful not to concentrate too much heat on the seam.

For most modelers one of the most difficult parts to cover is the wing tip. Actually, it's really quite easy. All you have to remember is that once it's on the wood, it has ceased to shrink. So what you do is *stretch* out the wrinkles before you iron it down. You do this by, first, leaving enough material to grasp onto, and second, by applying heat to the material as you pull it. Starting at the point at the tip that protrudes the farthest, hold the material in one hand and pull while heating it with the iron in the other hand (it helps to have three hands for this maneuver!). As you heat and pull, the material will stretch. As it does, lay it onto the wing tip. Do this until you have the front radius of the tip done. If there are any wrinkles, simply pull the material up off the wood and try again. This method is also good for covering the corners of the stab or other places where there is a radius.

The addition of trim colors, such as a thin stripe or stars, etc., can easily be done with mylar over mylar. The thing to remember is that in this application there is nowhere for the air to escape, thus it will be trapped underneath, leaving you a lot of unsightly bubbles. The way to handle this is to turn the heat on the iron down and use the side edge of the iron. Start at one corner of the trim piece, holding it off the surface as you go. Once it is down, don't go back over it, or more bubbles will develop.

Once you learn these techniques, you'll be amazed at the results.

Next month, I'll go into the proper way to install radio equipment. I hope you'll be here.

Dan Santich, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

Top Flite Models, Inc., 2635 S. Wabash Ave., Chicago, IL 60616. ■

GIANT STEPS

(Continued from page 82)

dope and then allowed to dry. The material is then laid in place and the dope reactivated with either dope thinner or acetone. This allows the Dacron to be stretched tight without heat. When it is subsequently shrunk, a drum-tight covering job is the result. (Be careful with this as light structures may be warped out of shape by the amount of shrink.)

Although some of the materials mentioned here will add weight to a project designed for balsa, it is usually not enough to create a problem in larger models.

(Continued on page 118)

GIANT STEPS

(Continued from page 117)

Those of you who build from plans will find the materials mentioned will reduce the cost of your next project dramatically and may also provide you with a much more robust model as well.

As we make our way into another flying season, enjoy the hobby by flying safely. Until next month.

**The following is the address and info pertinent to this article:*

Jim Messer's Quality Model Products, 106 Valleyview Dr., Allegany, NY 14706.

Home-built supply companies: check an issue of Sport Aviation, *magazine of the Experimental Aircraft Association (EAA) for their addresses. Copies of* Sport Aviation *are usually available at your public library.* ■

AGGRESSOR

(Continued from page 94)

the design will handle such speeds and Gs, I'm not so certain that the servos or linkages would appreciate it for a very long time.

I installed a speed brake instead of flaps in the belly pan to help when flying from small fields. It really does help to slow the Aggressor down if you're coming in a little hot. However, with some practice you'll find that the airplane lands just fine without the flaps or the brake. Takeoffs from short fields are no problem at all. Just let it roll about 80 feet and point the nose toward the clouds. Exhilerating to say the least! You just can't believe that all this performance is coming from a jet with no cheater holes! That's right, those inlets you see were designed by computer to mate up perfectly to a tailpipe (also computer-designed) that insures maximum performance without you having to hog out a huge hole in the bottom of the airplane. You just gotta give Mr. Violett credit for a job exceptionally well done.

Here's a list of some of the components you'll find in any of the Sport Shark or Aggressor kits: pre-built sings, stab and fin ready for MonoKote or glass covering; pre-cut rudder and elevators; wing panels pre-marked for aileron and/or flap separation; bellcranks and pushrods installed in-wing; wing removeable with 4 bolts; flaps pre-engineered for the modeler if he chooses to use them; extensive use of carbon fiber for increased strength and low weight; main retract mounts installed at the factory; high-quality fiberglass components, including fuselage and top hatch; nose gear hatch, inlet lips, and tailpipe; all cowl and hatch fittings supplied; all hardware supplied; stab and wing alignment points molded in fuselage; clear plastic canopy; material for servo trays; flex plate for nose gear mount; comprehensive instruction booklet.

**The following are the addresses of the companies mentioned in this article:*

Bob Violett Models, 1373 Citrus Rd., Winter Springs, FL 32708.

Futaba Corporation of America, 555 West Victoria St., Compton, CA 90220. ■

PATTERN

(Continued from page 74)

aileron, plus servo reversing on all 5 channels. Should be one heck of a radio system, and I'll bring you the low-down soon. See your dealer.

The last item this month has to do with the latest from Hobby Shack* and the EZ line of aircraft. I just got my dirty paws on the EZ Supra-Fly, designed by Hanno Prettner. I first saw this ship being flown by Steve Helms when it was still a prototype. It displayed solid flight characteristics and did a good job for Steve. The second time I saw it was at the Hobby Shack Four Stroke Fly-In in Riverside, California. There, Hanno himself demonstrated the kit bird, again leaving a good feeling.

For more information on this bird, see my Field & Bench report elsewhere in this issue.

Till then, we're on the pipe and airborne!

Mike Lee, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Futaba Corporation of America, 555 W. Victoria St., Compton, CA 90220.

Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728. ■

HELICOPTERS

(Continued from page 61)

part that's made from bare wood should be fuel-proofed and painted, which will keep the wood from becoming contaminated due to the oil in the fuel and make the part look finished.

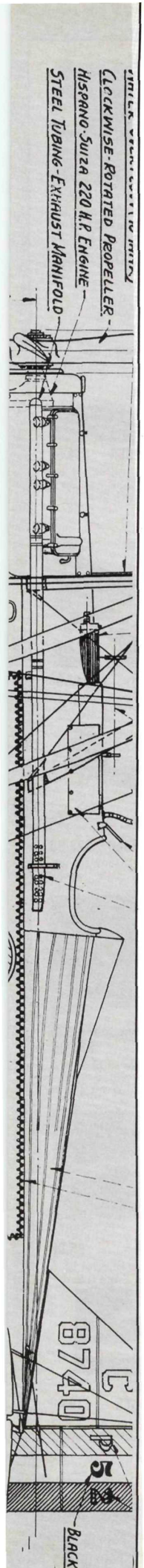
Finishing the plastic parts and any of the wooden external parts can be accomplished many ways, depending on availability of equipment, such as sprayers and compressors, and your experience as a painter. It's not necessary that you spend a great deal of time on the appearance of your first machine. Instead, concentrate on building a mechanically sound and rugged machine that will serve you while you learn.

Once you have all of the wood and

(Continued on page 122)

The Great R/C Design Contest

Sponsored by **Model Airplane News**, Hobby Shack, Airtronics, Midwest Products, Top Flite, and United Models.



Now is your chance to become a famous modeler!

The top five designs will be featured in **Model Airplane News** magazine as feature construction articles. All entries, however, will be considered for future construction articles, so get designing and building right now!

1st Place—$2,000 cash

2nd Place—$1,000 cash plus Hobby Shack EZ Laser, Airtronics, CS7P radio, and Saito .90 engine.

3rd Place—$500 cash plus Midwest Super Hots kit, O.S. .60 engine, and Airtronics radio.

4th Place—$400 cash plus Top Flite P-47 kit, Enya .60 engine, and Hobby Shack radio.

5th Place—$300 cash plus Midwest Hots kit, and O.S. .40 engine.

How to enter:

Simply submit a clear photograph of your model no later than June 1, 1987. Any type of model R/C airplane qualifies. Previously published or manufactured designs are not eligible.

Who decides the winner?

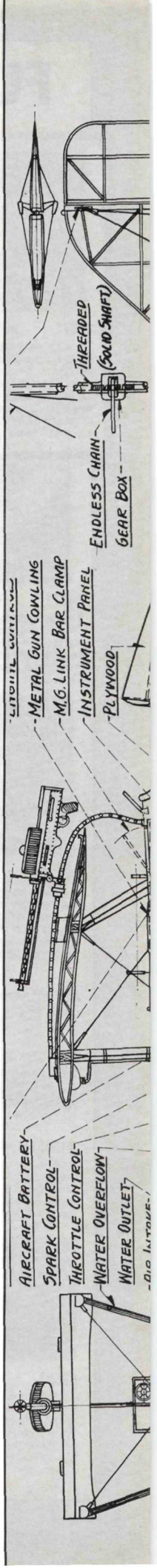
You do! The top designs will be determined by your vote. The September 1987 issue of **Model Airplane News** will have photographs of the models listed by number. Just send us a postcard with your favorite design listed and we'll take it from there.

Announcement of winners:

The December 1987 issue of **Model Airplane News** will feature a full spread of all the winners as well as a feature construction article of the 1st-place winner.

Be prepared:

Winners must be prepared to submit a complete construction article (6 to 8 typed, double-spaced pages), plus black and white photographs of the building sequence, full-size construction plans, and color slides of the model in static and flight conditions. Prior to the announcement of the winner, the publisher must receive verification that plans, photos, and manuscripts of the top five designs are available.



NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to **Model Airplane News,** Name the Plane Contest (state issue in which plane appeared), 632 Danbury Rd., Wilton, CT 06897.

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to **Model Airplane News.** If already a subscriber, the winner will receive a free one-year extension of his subscription.

The Italian aircraft firm Magni was formed in 1919 by Signor Magni, a man noted for his keen sense of design. His airplanes were art forms in three-dimensional reality, and the Vale, our mystery plane for February 1987, vividly portrays this.

Built almost entirely of plywood, it used a Farina T.58 five-cylinder engine, had a wingspan of 29 feet, 2 inches, a length of 18 feet, and a top speed of 161.5 mph.

Congratulations to George M. Fuller of Manchester, Missouri, for correctly identifying our mystery aircraft.

HELICOPTERS

(Continued from page 118)

plastic parts ready to go, turn your attention to the engine. Run-in the engine on a test stand before you put it in the helicopter. If you do this now, you'll save yourself more frustration later when you discover that you have the clutch and cooling fan already installed and now you need to remove them to break-in the engine. The engine run-in requires a test stand, which is available in a selection of configurations from a simple metal mount that screws to a bench to a full test stand with fuel tank and throttle linkage. At any rate, *never* clamp the engine in a vise or to the bench without the use of one of these specially designed mounts.

If you're unfamiliar with the operation of two-stroke model engines, be sure to read the instructions carefully during break-in and follow the engine manufacturer's procedures exactly. Different types of engines require completely different break-ins. Different types of engines include ringed engines, lapped eng-

Club of the Month

The Mercer County Radio Control Club of Trenton, New Jersey, is the *Model Airplane News* "Club of the Month" for April 1987. Elections for 1987 saw Doug McMillan emerge as president, Dave Babcock as vice president, George Coleman III as secretary, and Joe Dutko as treasurer.

Warren Kruse is the club expert on cutting foam wings. At a recent meeting he demonstrated his skills so well that Wes Rouse decided to try it. After going through 10 cubic yards of foam, Wes finally decided to go back to kits.

Nancy McMillan is the wife of the president, and proud of it. She is so proud that she recently wrote a piece for the club newsletter "Propwash" titled "And the President is Mine," in which she proclaimed, "Your president is great, fantastic, kind and considerate, congenial, helpful, a friend, a pal, a companion, a father, and last but not least a husband who has a wife who *can* have everything she wants."

At the annual Christmas party, outgoing president Joe Spett was awarded an honor he has strived harder than anyone else to achieve, the coveted Most Improved Flier Award.

Model Airplane News applauds the Mercer County Radio Control Club and is pleased to award two free one-year subscriptions, which are to be given by them to their outstanding junior members.

Congratulations! ■

Each month Model Airplane News will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). Model Airplane News will award two free one-year subscriptions to be given by the club to outstanding junior members. So send your newsletter to Model Airplane News, Club of the Month Contest, 632 Danbury Rd., Wilton, CT 06897.

ines, and ABC engines. Most of these terms refer to the types of piston and cylinder combinations. When you're running the engine on the test stand, use a propeller intended for use in a model airplane. The instructions for the engine will make recommendations as to the range of prop sizes. You should use a prop that's in the middle of the scale for break-in unless otherwise specified. Pick a fuel that's in the 5% to 15% nitromethane range. Also look for a fuel that's colored for use in helicopters and is readily obtainable. Be sure to pick up some extra glowplugs too, as some new engines will burn out a plug fast.

Once you have the engine running and feel that you have sufficient break-in time on it, try to set the fuel mixtures on the carburetor so that the engine will consistently idle smoothly without dying, transition to full throttle without hesitating, and run wide open without sagging or overheating. While you're at it, test the engine in the mid-range to see if it will run smoothly and dependably, as this is where most of the engine running time will be spent.

Let's take a closer look at adjusting the engine. Many of the questions I've answered pertain to understanding the engine. First, go to wherever there are people flying in your area and listen to the engines. Get a feel for the sound an engine makes. If you can't find anyone flying in your area, imagine the sound of a chainsaw running wide open and then raise that about one octave. This will be close to what your engine should sound like at full throttle. When the engine is running at full throttle, turn the main needle valve out (usually counterclockwise) until there is quite a bit of smoke and the sound has considerably lowered in pitch. Next, turn the needle valve in until the engine reaches a peak high-pitch sound. This condition will be full lean. Repeat the process a few times until you're sure you can set the engine from rich to lean. Before you remove the engine from the stand, set the main needle to just slightly rich (back off from full lean about one-quarter turn), and recheck the idle and mid-range for smooth, consistent running. You'll probably have to remove the main needle valve to install the engine in the helicopter. At this time you should turn the needle valve in slowly, making sure to count the number of turns until it just stops. Now record this figure (writing it in the instruction manual is a good idea). This will allow you to remove the main needle valve, and then set it back to the proper settings when you replace it.

Well, that should give you plenty to do until next month when we can start to construct the mechanics. I'll cover the various areas of the helicopter in detail as we go, giving you some options as to balancing and adjusting components. If you just can't wait to move on, be sure to study your drawings, and read the instructions carefully as you go.

More on Yale Hobby Manufacturing

Let's take a look at Yale's line of Tru-Spin rotor blades, which are intended as replacement blades for practically all model helicopters. The blades are constructed from a total of five laminations of a combination of two types of wood. There are three laminations of a hardwood like maple which make up the leading edge and center part of the blade, and the trailing edges are made from two laminations of a softwood from the Phillipines called "Samba." Sambawood is similar to hard balsa except that it has a very consistent density from end to end. This makes it much easier to control the weight and stiffness from one blade to the next.

The lamination process is accomplished in a special clamping jig that ensures uniform pressure for gluing and curing. To avoid an occurence of delamination during operation, a special adhesive considered by the FAA as the best choice for use on home-built aircraft is used for all joints. Once the blades are laminated together, they're shaped by custom-made machinery to the exact airfoil for the application. After this, the blades are jigged and accurately drilled for the main bolt holes. Some of the blade sets will include machined blade holders and brass bushings.

Yale Hobby president Jeff Urcan says that, "Close examination of the blades will reveal that the grain in one blade matches the other, and that all Tru-Spin rotor blades are backed by a 100% replacement or money-back guarantee for manufacturing defects." Each set of Tru-Spin rotor blades includes heat-shrink covering material and complete instructions. Tru-Spin rotor blades are available for special applications also, such as the pre-slotted blades that accept the non-metallic Yaleweight and custom blades with the blade holders already installed. If you haven't tried these rotor blades yourself, I recommend them as there's a big difference in the way they fly when compared to the blades that come stock with most kits. Other items available from Yale Hobby Manufacturing will be covered in future articles.

(Continued on page 126)

ADVERTISERS INDEX
APRIL 1987

Classified

RAZOR BLADES: Single-edge industrial quality, super sharp. 100/$4.25, 200/$8.50, 300/$12.50, 500/$20.50, 1,000/$40.50; add 10% postage west of the Mississippi. Cobbie's Gifts, Box 2, Deal, NJ 07723; 201-922-9898.

WANTED: RTF U-Control planes from Cox, Wen-Mac, Comet, Aurora, Testors, etc., complete or pieces, buy or trade. John Fietze, P.O. Box 593, Lynbrook, NY 11563.

VIDEO ON COVERING: *Model Airplane News* presents an hour-long, professionally produced, instructional video cassette on envelope covering by Dick Phillips. For beginner or expert, regardless of plane size. Ideal for clubs and hobby shops too! Each cassette (specify VHS or BETA) is clearance priced at $29.95 (reg. $39.95), plus $1.75 postage and handling (foreign and Canadian orders, add $3.00). *M.A.N.*, 632 Danbury Rd., Wilton, CT 06897.

ANTIQUE MODEL IGNITION ENGINES—PARTS CATALOG, 50 pages, precision cast timers, original cylinder heads, point sets, drive washers, tanks, for GHQ, O&R, O.K., many others. Large catalog $4.00 pp. Chris Rossbach, RD 1, Queensboro Manor, Gloversville, NY 12078.

HARDWARE AND SOCKET HEAD cap screws, all sizes, low prices. Write for complete list. Example 6-32x1" only $4.25 per hundred. Micro Fasteners, P.O. Box 42A, Netcong, NJ 07857.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; 918-245-3649.

BEGINNERS, discouraged by too-fast R/C "trainers"? Send $1 and a stamp for no-holds-barred evaluation of over 20 well-known models rated for their ease-of-flying. James Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

FOR SALE: *Flying Aces* 1935-1944, *Model Airplane News* 1931-1960, others. $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

BOOKS FOR MODELERS. Out-of-print/current, 400+ items list $1. John Roby, 3703B Nassau, San Diego, CA 92115.

FIGHTERS! Most complete collection of aircraft prints, posters, and postcards. Free catalog! MACH-3, Box 1390C, St. Louis, MO 63188.

ATTENTION, COLLECTORS: For sale, Brazilian-produced WB diesel and glo engines, 1.5cc, 2.5cc, .35. Price U.S. $150/part. Udo Eugen Linke, Caixa Postal 24 18130-Sao Rogue, S.P., Brazil.

PRIVATE COLLECTION: Hundreds of aviation magazines for sale—*Popular Aviation, Flying, Model Airplane News, Air Trails, RAF Flying Review, Wings,* and many others. 1932-1960. All in excellent condition. Send $2 for list. William C. Fort Jr., 4161 Robin Hood Rd., Jacksonville, FL 32210.

SCALE DOCUMENTATION: PLAN ENLARGING. Photo packs, 3-views, drawings for 1,600 aircraft, super-scale R/C plans for Giant, Sport; 30-page catalog $3. Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; 919-292-5239.

FOR SALE—GREAT OPPORTUNITY: Schluter Heli-Star helicopter constructed by perfectionist and flown only one hour, Futaba 7-channel radio, and full accessory list too large to mention—all new. Retail value over $3,000, yours for only $1,500 firm. Call 617-295-7476 days and 295-7351 evenings. This won't last long.

JETEX ITEMS AND KIT WANTED for cash. Kits by such makers as American Telasco, Berkeley, Comet, Cleveland, Monogram, Tailored, and others. Paul Williamson, 5032 S. Ridgeview, Nashville, TN 37220.

MODEL ENGINES, IGNITION AND GLOW: collectors, runners, used, new. Sell, trade, buy. SASE for engine list. Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555, 619-375-5537.

FOR SALE: Reconditioned Kraft radios, and other brands of American-made radio systems. We still buy used Kraft Systems radios all years, and have a good selection of 7-C systems which are 1991 ready now. New order of 8FD receivers and modules just in, $150.00/set. More Channel Masters also just arrived at the new price of $175.00/set. Jay-En R/C now has transmitter and airborne Ni-Cd packs made exclusively in our shop with American-made cells. JN-900: 900-mAh with Kraft connector 4.8-volt flat or square $26.95 each; JN-1200: 1200-mAh 4.8-volt pack with Kraft connector flat or square $36.95 each. These packs are warrantied for 13 months and are available with Futaba, JR, Airtronics connectors at the same price. Transmitter packs for Kraft available 700-mAh for 5C or 7C transmitters. New store hours: Monday through Saturday 9:00 to 7:00 p.m. Closed Sundays. Jay-En R/C Supply, P.O. Box 4248, Hilo, HI 96720; 808-961-5100.

SEMI-KITS FABRICATED from your plans. Parts cut from balsa, bass, pine, maple, and plywood. Custom wood sizes and shapes cut from your specs. Send SASE for quotes. Model Wood Specialties, 4209 24th St., Kenosha, WI 53142.

HARRY HIGLEY BOOKS: *There Are No Secrets*—on finishing model aircraft, including paints, adhesives, heat-shrink plastics, shaping, sanding, priming, etc. *Harry's Handbook for Miniature Engines*—from basic theory, components, and fuel to break-in, repair, and new developments. *Master Modeling*—explains drawing plans, how to scratch-build, use plastics, foam, fiberglass, balsa, and plywood. *Tom's Techniques*—from Tom Ingram, in collaboration with Higley, applying plastic film, covering wings, fuselages, Horner wing tip fillets, etc. Hundreds of photos. All books are $10.95 each, plus $1.50 postage each. *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

COLLECTORS: Hard-to-find kits: planes, armor, cars. List $2.00. Vintage Hobbies, Box 5091, Station F, Ottawa, Ontario, Canada K2C 3H3.

MAGAZINES FOR SALE: *Aeromodeller, Airpower, Wings, Air Trails, Scale RC Modeler, Model Aircraft, Flying, Skyways,* and more. Many going back to 1930s and 1940s. Excellent to mint condition. Send SASE for list of titles, any inquiries to Mrs. Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086; 716-681-4840.

HUGHES 500DE, JET RANGER heli fuselage, replace those unsightly holes of cutout windows with an Air Screen Kit, finish with a professional look, order now! Kits $5.45, $1.50 postage, information brochure $1.00, to Alvin Harris, P.O. Box 3462, 1018 E. 23rd Ave., Tampa, FL 33601.

JET ENGINE BUILDERS: I have P-38 Fanjet plans, "Screaming Demon" supplements, pulse jets, design studies for Dynajet-powered models, and a "Screaming Demon"-powered ultralight. Catalog and newsletter $5.00. Al Doyle, 4015 San Jacinto #404A, Houston, TX 77004.

WANTED: Ford Trimotor balsa flying model kit by Sterling. Will pay premium price. R.C. Winters, P.O. Box 354, Wheatland, CA 95692.

NOW USE REMOTE CONTROL in model rockets. Plans and instructions $4.95. Kurzynski, P.O. Box 202, Dept. A, Pulaski, WI 54162.

NYLON MACHINE SCREWS, nylon wire ties, reusable polyetylene glue guns. Nylon hex nuts, cap nuts, wing nuts, washers. Nylon hex head cap screws. Domestic and metric. Quantity discounts. Free catalog. Transmotions Inc., P.O. Box 160, Dept. M, N. Hollywood, CA 91603-0160.

AVIATION MAGAZINES from 1932 onward—*Model Airplane News, Flying Aces, Daredevil Aces, Cross & Cockade, AAHS Journals, Air Progress,* etc. For 8 page list send a buck. John Woska, 3040, 6559 W. Foxridge Dr., Mission, KS 66202.

ENGINE COLLECTORS: Spark ignition and old diesels for sale. Riccardo Taccani, CP59, 6834 Morbio INF Switzerland.

Send ad and payment to *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, $4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis—retailers, manufacturers, etc.). Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 15th of the third preceding month (for example, January 15th for the April issue). We do not furnish box numbers. If you would like your ad to run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies or tear sheets.

HELICOPTERS

(Continued from page 123)

Pro Tip of the Month

Be sure that the center of gravity of your helicopter is slightly forward of the main shaft, which will greatly aid the performance of the helicopter during rolls, and also somewhat improve the hovering stability. Evidence of a tail-heavy helicopter can be seen when turning the helicopter in forward flight, and watching the tail. If the tail continually drops in the turns, the machine is probably tail-heavy. Add lead weight to the nose of the helicopter and be sure that it is well secured and cannot vibrate loose.

That takes care of this month. Please send me any good black and white photos and information about what you're doing. I look forward to hearing from you.

Craig Hath, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

Yale Hobby Manufacturing, 20 Holly Lane, Wallingford, CT 06492. ■